The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. II. JANUARY 17, 1920 No. 31

Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Other communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- Abroad. Cheques, P.O.O.'s, and Postal Orders should be payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4.

Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (4 lines)

Nitrogen Products Report

THE final Report of the Nitrogen Products Committee was published on Thursday, and it seems almost incredible that as long ago as August 30 last, complaint was made in these columns of the dangers and disadvantages of further delay in the dissemination of valuable material, which is national property. As a result of this delay some parts of the Report are already almost out of date, though, fortunately, the firms more closely concerned with the future of the Empire's nitrogen industry have not been kept in ignorance.

The Report, as will be clear even from the brief summary which we are able to give in this issue, provides carefully sifted and collated data of vital interest, not only to almost every branch of the Chemical Industry, but also to gas works, electric supply undertakings, fertiliser manufacturers, and the commercial world generally. It effectually and authoritatively disposes of many fallacies, and no praise can be too high for the valuable and painstaking services of the distinguished men who, by their patriotic labours, have enabled such a wealth of information and experience to be presented in a thoroughly clear, readable, and logical manner. While it would be invidious to single out any members of the Committee for praise in this connection, it may fairly be stated that the work of Dr. J. A. Harker in his capacity of Director of the Nitrogen Research Station, and Mr. R. T. G. French, Secretary to the Committee, have been almost invaluable. The Committee comprised the best available ability in the country, and included representatives of the principal technical and learned societies, and of Government Departments. Curiously enough, the Society of Chemical Industry was not officially represented, although perhaps Dr. Carpenter may be assumed to have combined this function with his specialised knowledge of gasworks practice.

The Committee has wisely adopted pre-war conditions as the only satisfactory basis for dealing with the questions of costs and prices, and has avoided making allowances for royalties, licences and the like. Paragraphs 115 to 118 draw attention to the difficulty of finding sites for super-power stations, with sufficient circulating water available for condensing purposes, and strike a balance between the extra costs due to cooling tower installations near the pit-head and the cost of transporting coal to a more suitable locality. As regards such power stations in their relation to the nitrogen problem, the broad conclusion seems to be that the application of by-product recovery processes to power production offers no immediate prospect of advantage, as against modern and proved plant with direct coal firing. Some hope is, however, held out for the prospects of low temperature carbonisation processes, with subsequent complete gasification of the resulting coke under ammonia recovery conditions. Nothing is, however, said regarding the possibility of burning the low temperature coke in powdered form.

Among the partly-developed processes of nitrogen fixation the modified Häusser process and the Cyanide process are considered as promising and well worthy of a trial, but in considering the whole question it is somewhat startling to find it stated in par. 445*h* that Chile Nitrate may eventually have to face a competitive price of £7 to £8 per metric ton for ammonium sulphate, and £6 to £7 for cyanamide, and that its price may ultimately have to be £8 per ton or less.

Other points that may be noted at this stage are the absence of any reference to ammonium sulphite as a fertiliser, and the notes on the manufacture of Sulphate of Ammonia from Gypsum, the details and possibilities of which were described by Mr. Wride in our last issue.

Perhaps the most far-reaching suggestion in the Report is that made in par. 646 that "in the opinion

of the Committee, the time has arrived when coal economy and conservation in commercial working should be secured by setting up definite standards, based upon the qualities of coal in use, and upon practice that has been uniformly realised under good working conditions. Industries which are large consumers of coal should be required to conform to such standards. As an initial step, standards of ammonia recovery should be formulated and made applicable to all the larger works treating coal under by-product recovery conditions."

In commenting on August 9 last in these pages upon the Alkali Works Report, we ventured to express similar opinions, and even at the risk of continued bureaucratic interference in our works, there is a good deal to be said for a scheme which aims at a united national campaign for economy and efficiency, which alone will enable us to meet future competition effectively. Let us hope that the solution of national problems, other than that of nitrogen fixation, will in future be considered in an equally thorough and scientific manner, but at all costs without any delay whatever in giving the fullest publicity to the results.

A Revolution in Soap-Making?

A FEATURE of quite exceptional interest in our issue of this week is the special article by Mr. F. E. Weston, which has been written for us in connection with the methods employed in the manufacture of soaps. It may be reasonably supposed that soap—unlike many other compounds in which chemistry plays so important a part—is not of interest to the chemist alone, but that it is (with, of course, the inevitable exceptions) of more or less immediate concern to civilisation as a whole. In these days, it must be confessed, this necessary commodity is something in the nature of a luxury; and, consequently, any process of manufacture which would reduce its cost by half is deserving of the strictest investigation and impartial criticism. It may, therefore, be of interest for our readers to know that the particulars of the suggested innovations which we give to-day were thought to be of such importance that a "campaign" to urge the necessity for their introduction had been contemplated by one of the leading daily newspapers. It so happened, however, that we were able to secure a prior right of publication, believing that the matter is one which in its earlier stages, at any rate, is best submitted to the judgment of technical minds, rather than to the freer imagination of the lay press.

It may be said at once that we preserve an absolutely open mind so far as the suggestions made by our contributor are concerned. We accept his statements as accurate and valuable, owing to the fact that he is a recognised authority on the chemistry of oils and fats, and writes, not hurriedly, but after having spent some considerable time in research work for an interested undertaking of no mean proportions. Mr. Weston indulges in no vague supposition, but backs up his statements by actual facts and figures as proved by experiments of an extended nature. If he is wrong, then it is for our readers to show up his miscalculations, and we shall be glad to give publicity to any criticisms and to forward these to Mr. Weston for his attention. The soap industry has, perhaps, always been regarded as a business of "interests," in which outside interference is unwelcome and in which conservatism rules. We cannot say that this is our own view of the matter, but whatever may be the facts we believe that, if every household in the country can be saved money, no interests, however large, could stand up against such a proposition.

To consider Mr. Weston's suggestions briefly, it may be recalled that the main constituent of soaps, or rather the factor which influences quality, is the proportion of fatty acids contained in the substance Soaps, in fact, as generally spoken of, are either the sodium salts (hard varieties) or potassium salts (soft varieties) of fatty acids of comparatively high molecular weight. Owing to the fact that mineral oils are unsuitable, although recent attempts to use them have been made, the soap ingredients have to be obtained from animal or vegetable fats, which are treated with caustic soda for the production of glycerol. Pure commercial soaps usually contain some 30 per cent. of water and from 60 to 65 per cent. of fatty acids, although high-quality "milled" varieties may contain up to 80 per cent. of the latter. The higher the proportion of fatty acids, therefore, the greater is the cost of the soap, and it is the high price of the ingredients which is responsible for the present cost of all forms of soap.

Colloidal chemistry, however, has, according to Mr. Weston, stepped into the breach, and the results of his experiments show that colloidal clay forms a perfect substitute for soap when incorporated therein up to a certain limit, and is followed, if anything, by an improvement in detergent and emulsifying properties. We have in this country considerable deposits of clay, some of which may be suitable for the purpose, and which can be cheaply mined and dealt with. According to Mr. Weston, the colloidal clay, which forms the subject matter of his article, is prepared by a patented colloidal process, and it would appear that many varieties of clay both in this and in other countries may be found to be amenable to the process. The use of clay does not, of course, imply that fatty acids can be dispensed with altogether; but Mr. Weston finds that their present proportion could certainly be halved.

It will interest our readers to know that Mr. Weston has agreed to reserve for THE CHEMICAL AGE the results of research work in other branches of chemical industry, in which colloidal clay lends itself for use.

Amalgamations

THE tendency towards the consolidation of great trade interests, which has been apparent for some time, has been strikingly illustrated this week by several announcements of "deals" affecting the chemistry industry. The most important is the practical acquisition by Brunner, Mond & Co. of the Castner-Kellner Alkali Co., on the basis of two fully-paid ordinary shares in Brunner, Mond & Co. for one fully-paid ordinary Castner-Kellner share. Brunner, Mond

& Co. already hold 250,000 shares, and under the new arrangement they will acquire not less than 562,500 of the remaining shares, giving them a holding of 818,500 in the Castner-Kellner's total capital of one million. The Castner-Kellner Alkali Co. dates from 1895, when it was registered to acquire from the Aluminium Co., Ltd., of London, and Solvay et Cie, of Brussels, the right of working the patents of Mr. Castner and Dr. Kellner "for the manufacture of caustic alkali and bleaching powder, by the electrolytic decomposition of salt or alkaline salts." In 1900 the entire business of the Aluminium Co. was absorbed. The financial position of the two companies is sufficiently shown in the following table of profits for the past four years :—

	Brunner Mond.	Castner-Kellner.
1918-19	£1,012,081	..... £190,655
1917-18	1,111,848	 261,339
1916-17	1,117,153	 263,321
1915-16	1,011,590	 262,207

In addition to this, an arrangement has been made whereby Guest, Keen & Nettlefolds, Ltd., acquire a controlling interest in John Lysaght, Ltd. It is understood that in the amalgamation the entity of each company will be preserved and that no substantial change is contemplated in the management, though there will be an interchange of directors. On behalf of the Pearson & Knowles Coal & Iron Co., Ltd., of Warrington, it is announced that arrangements are proceeding for the acquisition by a strong firm of Pearson & Knowles' ordinary shares at 30s. per share. The company own considerable coal mines and iron works near Warrington, and have already acquired the whole of the share capital of Rylands Brothers, Ltd., the ordinary share capital of the Partington Steel & Iron Co., Ltd., and a large shareholding in the Moss Hall Coal Co., Ltd. Some slight misunderstanding has arisen in the case of the British Glass Industries, Ltd., but the corrected statements make it clear that the amalgamation is an important one and includes a number of large concerns. Under the arrangement various companies will be amalgamated and controlled by a company to be called Webbs' Crystal Glass Co., Ltd., the controlling interest in which will be acquired by British Glass Industries. The arrangements will involve the issue of further capital, which will be offered to the existing shareholders of British Glass Industries, Ltd. An arrangement has been come to under which the Petroleum Exploration Co. and the Trinidad National Petroleum Co. will join forces on the basis of two £1 shares in the Trinidad Co. for one £1 share in the Exploration Co. Finally, it is announced by Turner Brothers' Asbestos Co., Ltd., Rochdale; the Washington Chemical Co., Ltd., Washington Station, County Durham; and Newall's Insulation Co., Ltd., Newcastle-on-Tyne, that it is their intention to submit proposals to the shareholders with a view to the amalgamation of the three companies. Under the proposed terms each company will retain its name and continue its present management and staff.

The effect of such arrangements as these is, no doubt, the stabilising of British industries by the elimination of needless competition and the pooling of capital and experience, and this, taken alone, represents a national gain. It is necessary to remember, however, that great trusts sometimes have their drawbacks as well as their advantages, and that the public interest may be affected where they are powerful enough to create artificial prices and conditions of trade. So long as these dangers are guarded against, collective action in British industry is all to the good.

The Calendar

Jan.		
19	Chemical Industry Club: "Some Aspect of the Photographic Industry." Dr. R. E. Slade. 8 p.m.	2, Whitehall Court, London, S.W.1.
20	Institute of Metals (Birmingham Local Section): "Season Cracking." W. H. Hatfield, D.Met. 7.30 p.m.	Chamber of Commerce Buildings, New Street, Birmingham.
20	Sheffield Association of Metallurgists and Metallurgical Chemists: "Primary and Secondary Causes of Failure." J. O'Connor. 7.30 p.m.	Assembly Room, Royal Victoria Hotel, Sheffield.
20	Manchester Municipal College of Technology (Dept. of Applied Chemistry): "Extraction Plant and Methods." H. J. Pooley. 4.30 p.m.	Manchester.
20	Institution of Petroleum Technologists: "Spontaneous Ignition Temperatures of Liquid Fuels." Paper by Harold Moore, M.Sc.Tech., A.I.C. 5.30 p.m.	Royal Society of Arts, John Street, Adelphi, London, W.C.2.
20	Royal Institution of Great Britain: "Modern Development of the Miners' Safety Lamp." Sir John Cadman. 3 p.m.	Royal Institution, 21, Albemarle Street, London, W.1.
20	Mineralogical Society: Papers by Dr. E. S. Simpson, C. E. Barrs, Dr. G. T. Prior and A. F. Hallimond. 5.30 p.m.	
21	Royal Microscopical Society. 8 p.m.	
22	Royal Society. 4.30 p.m.	Royal Society, Burlington House, Piccadilly, London, W.1.
22	Society of Dyers and Colourists (West Riding Section): "The Application of Electricity in the Dyeing Industry." F. Mollwo Perkin, Ph.D., F.I.C.	Bradford
23	Institute of Metals (Sheffield Local Section): "Defects (and their Causes) in the Manufacture of Spoon and Fork Blanks." J. A. Morton, Assoc.Met. 7.30 p.m.	Mappin Hall, Sheffield University.
23	Royal Institution of Great Britain: "Researches at High Pressures and Temperatures." The Hon. Sir Charles Parsons, K.C.B. 9 p.m.	Royal Institution, 21, Albemarle Street, London, W.1.
23	Physical Society. 5 p.m.	Imperial College of Science
26	Royal Society of Edinburgh. 4.30 p.m.	Edinburgh.
27	Manchester Municipal College of Technology (Dept. of Applied Chemistry): "Drying Machinery." E. A. Alliott, B.Sc. 4.30 p.m.	Manchester.
29	Society of Dyers and Colourists (Bradford Junior Branch): "Some Defects Developed during Dyeing and Finishing." Professor E. Midgley.	Huddersfield.
29	Royal Society. 4.30 p.m.	Royal Society, Burlington House, Piccadilly, London, W.1.

Colloidal Clay in Soap Manufacture

By F. E. Weston, B.Sc., F.I.C.

The writer of this article has, during the past year or so, been associated in a consultative capacity with an important industrial undertaking for which he has conducted special work in connection with the utilisation of colloidal clay. He has made a particular study of the uses to which this substance may be put in various branches of chemical industry, and in his first article he makes some suggestions in connection with soap manufacture which should excite further discussion and inquiry. The immediate point which arises is: If Mr. Weston is correct in his surmise as to the use of clay in soap manufacture, what is likely to be the effect on the price of this necessary commodity?

Colloidal Chemistry—a branch of chemistry of modern growth—has revealed much in technological processes that was formerly little understood, and has brought many processes that were of an empirical nature (and, therefore, more or less a matter of uncertainty as to their success) into the realm of certainty. Processes have been devised whereby substances, formerly classed as insoluble bodies in water, may be prepared in such a fine state of division as to enable them to be so dispersed in water that they produce colloidal solutions. Two notable instances of such bodies are silver and mercury, the colloidal solutions of which find valuable applications in medicine.

Clay, a substance possessing marked physical properties distinguishing it from most other mineral bodies, has generally been regarded as of a colloidal nature, but it is only in recent years that it has been shown to be a true colloid inasmuch as clay is now obtainable in such a fine state of division that true colloidal solutions can be made therefrom. This colloidal clay belongs to the general class of "suspensoids," and is a reversible colloid, since it is possible to disperse it in water, or throw it out of colloidal solution at will.

Preparation

True colloidal clay is prepared from China clay—a product in which this country is very rich—also a mineral that has found very many technical applications besides the very important one of porcelain manufacture. It can, however, be confidently asserted that the uses to which colloidal clay is already being put, and will in the future be applied, far transcends in importance any of the ordinary processes for which China clay is now used. One of the many and varied applications of colloidal clay is that of its use as an adjunct in the manufacture of soap. In this connection colloidal clay is not to be looked upon as a "filling" material for soap, nor as an adulterant, *but as an actual substitute for soap material.* As this statement is contrary to usually accepted conceptions of what soap is, and is of a revolutionary nature it is as well to discuss the matter in greater detail.

It may be asked, What is soap? Chemically, soap is a mixture of sodium or potassium salts of fatty acids obtained from the fixed oils or fats of animal or vegetable origin, or even from rosin; but, so far as the writer is aware, no satisfactory definition of the action of soap in washing and cleansing has yet been given.

The work soap does in washing and cleansing can only be satisfactorily explained by the laws of colloidal chemistry. Ostwald's conclusions are that in the process of washing colloidal chemical processes of all kinds take place, but that adsorption phenomena in particular play a very great part. Spring, who investigated the subject very fully, has also shown that adsorption is an important property of colloidal bodies, and that soap is adsorbed by many substances, and in the case of soot he was able to obtain adsorption complexes of soot and soap which passed through filter paper. He also arrived at the conclusion that the concentration of soap on the surfaces of the adsorbing bodies is the chief factor in the detergent action of soap. According to Michaelis, adsorption is the greatest for those substances which produce the greatest lowering of the surface tension of a liquid when in solution in that liquid.

Surface Tension

It is well known that soap, when dissolved in water, considerably lowers the surface tension of the water against air, and is, therefore, greatly adsorbed by other bodies. Other properties possessed by soap are its power of raising the viscosity of water, and its great emulsifying action on other bodies. There are many substances which, when dissolved, lower the surface tension of water against air, and whose solutions produce lather, but they do not possess the emulsifying power of soap. Moreover, unlike soap, they do not raise the viscosity of water so as to produce surface layers of marked rigidity, nor do they possess detergent properties. Clay, like soap, possesses the property of absorbing other materials to a marked degree; but what is not generally known is that clay can be brought to such a highly colloidal state that it closely resembles soap in its physical behaviour. Such colloidal clay when properly incorporated with soap actually increases the lathering and detergent properties of the latter, probably owing to the formation of a homogeneous mixture, namely, a solid solution, both being of a highly colloidal nature.

Below a certain concentration a solution of soap in water will not lather owing to the surface tension of the liquid not being sufficiently reduced to form a foam. Also, if to a solution of soap that will produce a lather on shaking more than a certain maximum quantity of alkali be added, the lather is destroyed owing to the soap coagulating or salting out.

To a suspension of colloidal clay in water add a certain amount of alkali, say, sodium carbonate, the clay disperses through the water and forms a colloidal solution, producing a more or less viscous liquid depending upon the amount of clay dispersed; in the case of a colloidal solution containing 40 per cent. of colloidal clay the liquid has the consistency of thick cream. Add to a colloidal solution of clay an amount of alkali in excess of the maximum required to produce colloidal dispersion and the clay coagulates or swells and settles out.

Detergent Properties.

Chemically, soap and clay belong to two distinct types of compounds, soap being a sodium salt of a fatty acid, whilst clay is an aluminium salt of silicic acid, or hydrated aluminium silicate. Physically, however, the solutions of these bodies resemble each other closely, viz., their surface tensions are lower than that of water, their viscosities are greater, they both possess emulsifying power, both have the power of adsorbing dirt, grease, &c., to a marked extent, and both have detergent properties.

The following experiments were carried out with a view to comparing the lowering of the surface tension of water by various substances with that produced by colloidal clay. So far it has not been possible to measure the surface tension of a solid against air or against a liquid, but by the use of colloidal clay it is possible to measure, by the capillary method the surface tension of equal parts

of colloidal clay and water against air. The following results were obtained by the capillary method :—

Liquid.	Surface tension.		
	At 21°C.	At 45°C.	At 95°C.
	Gm. cms.	Gm. cms.	Gm. cms.
1. Water	0·07205	0·06874	0·06116
2. 0·125 gm. sodium carbonate + 125 c.c. water	0·07127	0·06825	0·06096
3. 1 gm. sodium carbonate + 100 c.c. water	0·05765	...	...
4. 0·5 gm. aluminium sulphate + 250 c.c. water	0·06924	...	...
5. Saturated solution of lime water	0·06507	...	...
6. 7·45 gm. colloidal clay, 0·125 gm. sodium carbonate, 250 c.c. water	0·07013	0·06791	0·06013
7. 50 gm. colloidal clay, 0·5 gm. sodium carbonate, 50 gm. water	0·04279	...	...

It is thus seen that colloidal clay has a marked action on lowering the surface tension of water.

When incorporated with soap colloidal clay also tends to lower the surface tension of water to a greater extent than soap itself. The following experiments were carried out with a high class toilet soap (A) and a soap made up of 80 per cent. soap A + 20 per cent. colloidal clay (B).

Liquid.	Surface tension.	
	At 20°C.	At 45°C.
	Gm. cms.	Gm. cms.
1. 0·5 gm. sample A, made up to 100 c.c. of solution with water	0·02422	0·02215
2. 0·5 gm. sample B, made up to 100 c.c. of solution with water	0·02200	0·02062

It will be noted that the soap containing colloidal clay lowers the surface tension 9·1 per cent. and 6·9 per cent. more than the pure soap at 20 C. and 45 C., respectively.

Lathering Properties

Since the lathering properties of a soap increase with the lowering of the surface tension it is interesting to note the effect on the formation of lather by colloidal clay when added to a soap. It is also well known that the lathering and detergent properties of a soap are increased by the addition of alkalies in moderate amount, hence the following experiments were carried out. A solution was prepared containing 0·125 gram of sodium oleate in 100 c.c. of solution in water. 10 c.c. of this solution was mixed in a 50 c.c. graduated stoppered cylinder with 10 c.c. of normal soda solution. The mixture was then shaken backwards and forwards 20 times in 10 seconds and allowed to stand, when the volume of lather (*a*) and the volume of solution were read. A similar solution was made in another graduated cylinder, but with the addition of 0·01 gram of colloidal clay and the operations were repeated.

Lathering Experiments

	10 c.c. sodium oleate + 10 c.c. normal soda.		10 c.c. sodium oleate + 10 c.c. normal soda + 0·01 gm. C. clay.	
	(*a*)	(*b*)	(*a*)	(*b*)
1	16·0 c.c.	18·0 c.c.	19·8 c.c.	15·2 c.c.
2	16·0 ,,	17·0 ,,	20·7 ,,	14·8 ,,
3	16·3 ,,	17·2 ,,	21·6 ,,	14·9 ,,
4	17·0 ,,	17·0 ,,	21·6 ,,	14·9 ,,

These results, one of many series, show that the lather obtained by adding colloidal clay to the soap is much greater than that obtained by the soap itself ; moreover, in all cases the lather is of a firmer nature and is more persistent. It should also be noted that a larger quantity of water is converted into lather by the colloidal clay soap than by the pure soap. Experiments show that the amount of colloidal clay soap required to convert a given quantity of water completely into lather is about 60 per cent. of that required when using soap only. A further instructive experiment on lathering is the following :— The sodium oleate was diluted with distilled water till on shaking no permanent lather was produced ; a minute pinch of colloidal clay was then added, when on shaking a persistent lather was obtained.

Objections to Alkalies

Although alkalies are useful in increasing the lathering and detergent properties of soap they are extremely unpleasant to the human skin and very deleterious and harmful to textiles. Colloidal clay, on the other hand, being a perfectly neutral substance, is not only harmless to the skin and textiles, but it is actually beneficial to the skin, acting as an emollient and a germicide. In fact, a patent was taken out by Dr. Langheld, who attempted to cover the use of finely divided clay in preparations to be used as antiseptics for the skin.

Owing to the highly adsorptive properties of colloidal clay the presence of small quantities of alkali in the soap with which it is admixed is permissible since this will be mostly adsorbed by the clay and, therefore, rendered harmless. Several experiments have been carried out on the adsorption of alkalies by colloidal clay, of which the following is typical. To several portions of 6 grams of colloidal clay contained in large test tubes varying amounts of sodium carbonate were added and then 30 c.c. of water. After thorough agitation for one minute the tubes were allowed to stand overnight. Five c.c. of the supernatant liquid were then withdrawn from the tube and titrated with standard acid, and the amount of sodium carbonate found in the solution was calculated to the total 30 c.c. of original solution.

Expt.	Water added.	Sodium carbonate added.	Sod. carb. found (total).	Sodium carbonate adsorbed.	Per cent. adsorbed.
	c.c.	Gram.	Gram.	Gram.	
1	30	0·3	0·248	0·052	17
2	30	0·18	0·146	0·034	19
3	30	0·12	0·092	0·028	23
4	30	0·06	0·041	0·019	32
5	30	0·03	0·019	0·011	36

The above indicate the usual results obtained in absorption experiments, namely, the percentage of adsorption decreases with the increase in the concentration of the body absorbed.

Colloidal clay resembles soap in its power of emulsification. " An emulsion in the strict sense of the term is a system of two practically insoluble liquids, one of which is distributed in the other in the shape of small drops " (Willows and Hatschek). Pickering, however, has shown that emulsions can be obtained with oil and water if a third body is present which is insoluble in both oil and water, and Clowes has demonstrated that the emulsion may be either one of oil in water or water in oil, depending upon the relative amounts of oil, water and insoluble body. As an example of the emulsifying power of colloidal clay the following experiment is typical :— To 5 parts by weight of paraffin is added 0·5 parts by weight of colloidal clay ; on shaking and allowing to stand the clay settles out. On slowly adding warm distilled water and shaking, the whole mass suddenly swells and becomes viscous. When 5·5 parts of water have been added, and after standing a very small quantity of water separates, leaving above it an emulsion of clay, water and oil.

Advantages of Clay Soap

As regards the detergent properties of clay it is well known that grease and dirt are easily removed from the hands when rubbed with clay and water, and many

experiments have demonstrated that colloidal clay soap has far greater detergent properties than ordinary soap. It is the custom commercially to take as the criterion of a soap the percentage of fatty acids contained in the soap, since they are a measure of the actual soap substance present. The higher the percentage of fatty acids found the higher the percentage of soap substance present. This criterion will no longer hold since colloidal clay contains no fatty acids and, therefore, the determination of these will not afford any information as to the lathering and detergent properties of the soap examined.

The importance of colloidal chemistry in its application to industrial problems is only just beginning to be realised. This wonderful branch of chemistry is still in its infancy, but it is now appreciated that the applications to which colloidal clay can be put are infinite, fresh discoveries being made almost daily. In subsequent articles the writer hopes to deal with other applications of this clay in our important industries.

Nitrogen-Fixation

An American Report on European Plants

COLONEL J. W. JOYES, of the Nitrate Section of the Bureau of Ordnance, who recently returned from a trip to Europe with the United States Fixed Nitrogen Commission, gives an account of the development of nitrogen-fixation methods which he inspected during his visit to France, the portion of Germany occupied by the Allies, England, Norway and Sweden,

The Badische Anilin Plant

Concerning the plants of the Badische Anilin and Soda Fabrik for the operation of the Haber process, established at Ludwigshaven and Merseburg, Colonel Joyes says :—

"This process involves a number of most interesting steps in chemical manufacture. The outline of the process is generally known as the production of a mixture in suitable proportions of nitrogen and hydrogen gases and the combination of these into ammonia. All chemists know the difficulties involved in the necessity for using a catalyst to stimulate the reaction, which even then must be at high pressure and temperature, and get commercial results, and the necessity for having the gas mixture most carefully purified in order to avoid poisoning the catalyst.

"The Badische plant, existing on a small commercial scale at the commencement of the war, was greatly expanded under Government stimulation when the probable inability to bring in enough Chilean nitrate for war needs became apparent. The plant at Ludwigshaven, which was visited by the Commission, was not in operation, but the Commission had an opportunity to get a fair general idea of its magnitude, of the difficulties encountered, and of the apparent success with which they had been met. As it stands, it is said to have a capacity of over 200 tons of ammonia per day, and has installations for using this to make nitric acid, sodium nitrate, and several other products useful in agriculture as fertilisers, and in munitions and other manufactures.

"The plant is reported to represent an investment of several hundred million marks of the Badische Company's capital and undoubtedly a substantial Government subsidy. Notwithstanding the fact that the works give an impression of great complexity and therefore of large requirements in skilled and other labour for operation and maintenance, there is no doubt that whatever operating troubles occurred—and there must have been many—the plant did produce the much-needed ammonia; and if the statements made as to the writing-off during the war of a substantial portion of the value of the plant be true, it must be credited with commercial success under conditions of war. How this and the smaller establishment at Merseburg will meet the competition of the future, with the accompanying high prices for materials and labour, of course remains to be seen."

Cyanamide Plants in France

Vigorous efforts are being made in France, the Commission found, to use cyanamide, as such, as a fertiliser. In that connection, Colonel Joyes says :—

"During the war a number of cyanamide plants were built or commenced in France by private corporations and by the Government. Some of these were not finished at the time of the armistice and will not be available for production in the future, but there still remains in France a considerable increase in the capacity for manufacturing cyanamide, due to the war. Prominent officials of the French Government are keenly alive to France's needs for a more efficient agricultural system using much more fertiliser than heretofore. There has been much effort to stimulate the use of fertiliser by pointing out its advantages and by scientific research and demonstration. Arrangements have been made for marketing a considerable quantity of the cyanamide produced by the French Government in order that this cheap nitrogen compound made available by the war shall not be lost to agriculture. Although some portion will be converted into the more popular form of ammonium sulphate, &c., vigorous efforts are being made to induce farmers to use the cyanamide as such on account of the great economy which can be effected.

"For years Germany has been stimulating, by Governmental research, demonstration and publications, the use of cyanamide itself as a fertiliser. These efforts did not cease during the war, but were continued, and it appears that they have had a marked effect, inasmuch as the German farmers are using cyanamide for direct application to the soil to a considerable extent. Although many of Germany's cyanamide factories, the capacity of which was greatly increased during the war, are now idle for lack of raw materials principally, they remain available to produce a great quantity of this cheapest form of fixed nitrogen fertilisers."

Plant Development in Norway

"Especially interesting, from a civil engineering standpoint, were the water-power developments of the Norsk-Hydro arc plants at Rjukan, Norway, and of M. Ferdinand Gros in the Pyrenees Mountains in Southern France. In the former of these water from a lake high in the mountains was used successively in two 100,000 kw. power plants, each with a head of 250 meters, and later in several other plants with lower heads. In the latter, M. Gros has tapped a lake in the Pyrenees fed by perpetual snow, and, after successfully overcoming the difficulties of leading this water something over 20 miles through quite rough country, is able to use it with a head of about 800 meters, developing about 30,000 kw.

"M. Gros, a most progressive Frenchman, who has become noted for his introduction and production of liquid NO_2 during the war for use with benzine in air bombs, expects to use the Pyrenees power above mentioned in a new factory, now nearly completed, where he will make cyanamide for fertiliser use, and also other products."

Scandinavia's Increased Output

Cyanamide produeing capacity increased materially in Scandinavia during the war. "The plant of the Norsk-Hydro Company's celebrated Birkeland-Eyde arc-fixation process was practically doubled in 1915-16. This plant makes calcium nitrate as its principal normal product, which is used in Norway especially as a fertiliser for direct application to the soil. It has also been sold during the war to munitions manufacturers. This plant was one of the most interesting seen on the trip, as it demonstrates on such a large scale how a process with an extremely low technical efficiency can, under favourable circumstances and with clever engineering, be made to yield a handsome profit. This plant has enormous capital invested, with most advanced hydro-electric and electrochemical installations in substantial buildings of handsome and suitable design."

Valuable scientific research on the fixation problem was done in England during the war. If the war had continued England would have constructed several establishments to use some of the available processes.

American Claims

With these views may be compared those of Dr. C. L. Parsons, who was largely responsible for the development of the United States nitrogen-fixation plant at Muscle Shoals, as to American resources and processes. He claimed, in a recent speech before the Rochester Section of the American Chemical Society, that in spite of all Germany's efforts in this field there are processes in America which have been installed more cheaply and conducted more satisfactorily than any processes in Germany.

Final Report of Nitrogen Products Committee

We give below a short abstract of the contents and principal recommendations of this report, which has just been published, together with charts relating to the sulphate of ammonia and Chile nitrate trades. Further extracts and tables regarding costs of production will appear in a subsequent issue.

THE Committee was appointed in June 1916 shortly after the inauguration of the submarine campaign to consider the question of establishing in this country and in other parts of the Empire some of the newer processes for fixing atmospheric nitrogen in order to provide supplies of the nitrogen compounds essential for munitions and agriculture. The Committee was also required to carry out experimental investigations of such processes as appeared to be of utility. The Committee was composed of members nominated by Government Departments and by the principal scientific societies and of other leading scientific and industrial specialists.

Interim Report

In February 1917 the Committee submitted an interim report containing proposals for increasing the home production of nitrogen compounds for military and argicultural purposes. Among other matters, the Committee recommended :—

(*a*) The establishment on a large scale of one of the well-known nitrogen fixation processes, namely, the calcium cyanamide process.
(*b*) The establishment on a substantial scale of the ammonia oxidation process for obtaining nitric acid, the practicability of which had been demonstrated by the research work.
(*c*) The erection of a full-size trial unit for testing the synthetic ammonia (Haber) process, which had been shown by the research work to hold out very great promise.

For various reasons it was not considered possible to proceed with the erection of a factory for the calcium cyanamide process as recommended. On the other hand, the engineers of the Explosives Department considered that the stage reached in the research work on the synthetic ammonia process warranted the erection of a factory for the manufacture of synthetic ammonia and ammonium nitrate.

As the outcome of an alternative proposal put forward by that Department in October 1917, a commencement was made with the factory at Billingham for the fixation of nitrogen by the Haber process.

Final Report

The Final Report is divided into a number of sections, in which the various aspects of the nitrogen problem are reviewed in detail.

Section 13 (pp. 120-133) contains a summary of the Committee's conclusions and also general observations upon the matters dealt with in the preceding sections.

Review of Pre-war Position

In a preliminary statement the Committee emphasises the fundamental importance of nitrogenous fertilisers and the essential need of various nitrogen products for the manufacture of munitions and for important industries. A general indication is given of the relation between the older and newer methods or processes for obtaining nitrogen products.

With regard to the nitrogen industries before the war, it is shown that the demand *doubled* in the ten years, 1903-1913 (p. 19). Practically the whole of the world's demand was met by the Chile nitrate and by-products ammonia industries. The output of synthetic nitrogen products was relatively insignificant in spite of the notable developments of nitrogen fixation during the pre-war period (p. 19).

The Report then dealt with the pre-war position of the United Kingdom, which was a very large producer of by-product ammonia, but a relatively small consumer of all forms of combined nitrogen. The bulk of the home production of by-product ammonia was exported in the form of ammonium sulphate (*see* charts reproduced herewith), but the country was entirely dependent upon imports for the nitrates required in agriculture and essential industries, such as the explosives industry.

Power Production for Nitrogen Fixation

After indicating the power requirements of the various nitrogen fixation processes, and pointing out the importance of the cost of power as a factor in some of the processes, the Committee make a detailed investigation of the question of obtaining large supplies of cheap power for nitrogen fixation in the United Kingdom.

The production of power from coal is first dealt with, and an estimate is given of the cost of its generation in bulk by modern steam turbo-electric plant.

Consideration is then given to the important question, whether it is possible to cheapen the cost of electric power by submitting the coal to distillation and gasification processes, such as low temperature carbonisation, as a preliminary to power production in order to conserve ammonia and other by-products. This aspect of power production is dealt with exhaustively in Appendix IV., p. 169-217. A review is also given of the Committee's enquiry into the prospects of obtaining cheap water power in the United Kingdom, and of utilising peat for power production with ammonia recovery.

The Committee's conclusions (p. 43-45) point to water-power development as the cheapest source of power on a sufficiently large scale. It is also shown that in the present state of knowledge the application of carbonisation and other processes to power production in bulk offers no immediate prospect of reducing the cost of electrical energy from coal below the figures attainable by direct coal firing. High prices of coal and high rates of wages are a handicap to all by-product power schemes (p. 128), and the Report clearly indicates limiting prices of coal beyond which recovery schemes are unable to compete financially with direct firing.

Costs of Established Processes

The Committee has critically examined the costs of the established synthetic and non-synthetic processes and has prepared a reasoned estimate of the capital expenditure and working costs involved in operating them in the United Kingdom. The costs are summarised in Tables 35 and 36 (pp. 55 and 56).

The Committee's conclusions under this head (p. 59) indicate that synthetic fertilisers such as ammonium sulphate and cyanamide, and also synthetic nitric acid, can be produced at a cost, at the factory, which shows to very substantial advantage as compared with the pre-war market price of Chile nitrate and by-product ammonium sulphate.

Researches Undertaken

A summary is given (p. 64-70) of the research work carried out under the direction of the Committee. Important results have been achieved in connection with the synthesis of ammonia, the manufacture and purification of hydrogen, the oxidation of ammonia to nitric acid, and the production of synthetic nitrates. The results of the experimental and trial work formed the basis of the scheme prepared by the Explosives Department for the national nitrate factory at Billingham.

Effect of the War on Nitrogen Industries and on Future Policy

On account of the war demand the bulk of the world's supplies of nitrogen products have been diverted from agriculture to the manufacture of explosives. Statistics are given showing the expansion during the last four years of the Chile nitrate, by-product ammonia, and nitrogen fixation industries, and a review of the war positions in Germany and in the United Kingdom follows.

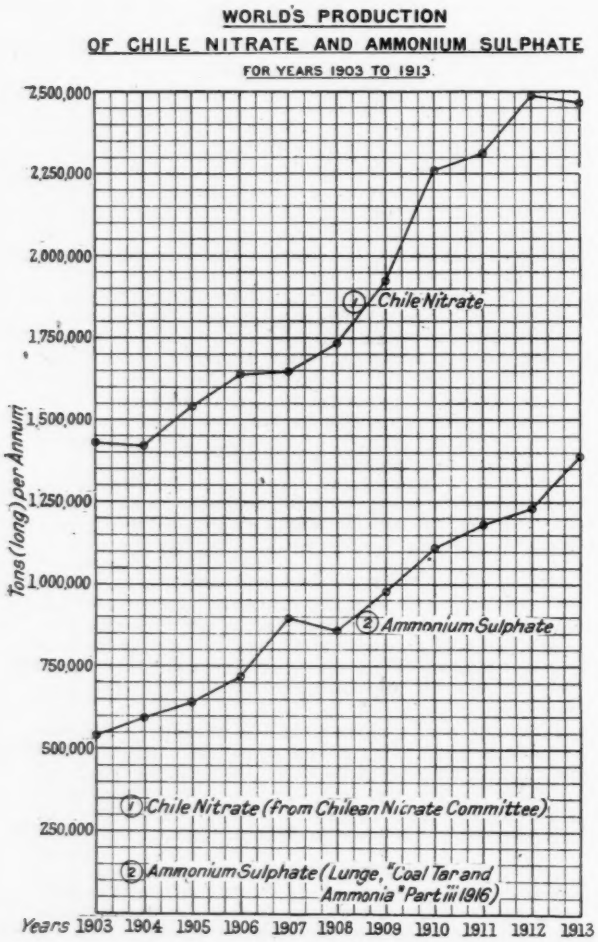
In Germany, which was the world's largest consumer of Chile nitrate before the war, the blockade and the enormous war demands have resulted not only in a large expansion of her by-product ammonia industry, but in a very remarkable development of nitrogen fixation. The estimated output of nitrogen products in 1917 was about three times her production in 1913.

In the United Kingdom, on the contrary, the home production of by-product ammonia remained practically stationary,

and the country has depended entirely upon imports of Chile nitrate for the manufacture of munitions (pp. 77-8).

The Committee contrasts the position of a country relying upon imported nitrates with that of one depending upon fixation processes principally as regards costs and shipping requirements (p. 78-80). It concludes that considerations of national safety of finance and of utility would alike force a country to resort in future to the policy of adopting synthetic methods as an insurance against emergencies instead of placing reliance upon the importation of Chile nitrate.

Chart C



Post-war Aspects of the Nitrogen Problem

Consideration is given to the economic conditions confronting the world's nitrogen industries and to international competition.

The Committee concludes that in spite of the great expansion of the nitrogen fixation industry during the war, overproduction is hardly likely to constitute a serious factor in the post-war situation (p. 120). Moreover, the demand for nitrogenous fertilisers is already considerably in excess of the pre-war consumption, and there will probably be ample scope in the post-war markets for both synthetic and non-synthetic products. The synthetic processes are also likely to supersede Chile nitrate as the source of nitric acid, but their position as regards the manufacture of artificial nitrates at a competitive price is more doubtful.

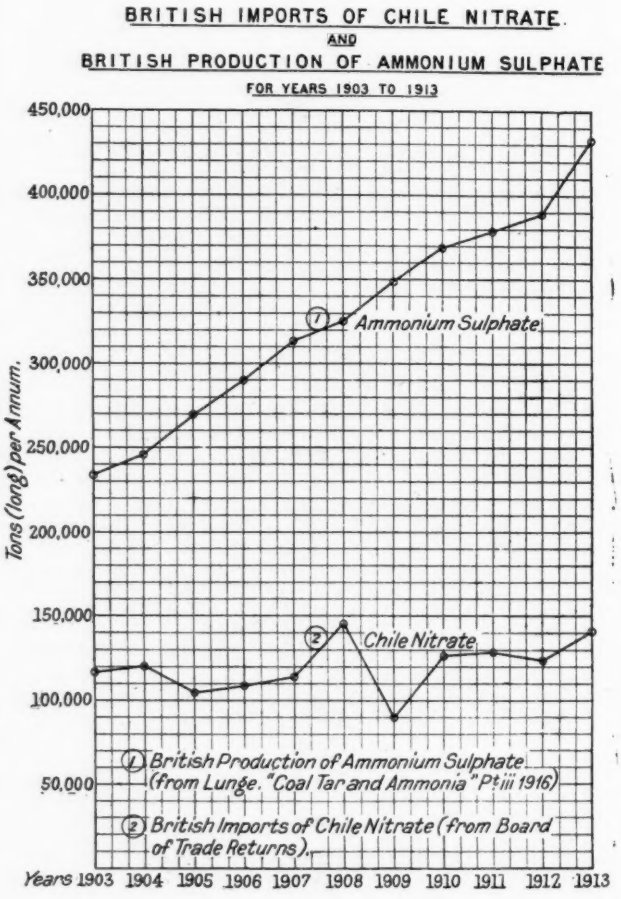
Requirements and Resources of the United Kingdom

The Committee in a reasoned estimate shows that the present demands for nitrogen products for agriculture and industry in the United Kingdom, are already more than double the pre-war demand, and that the needs in the near future will be still greater.

The Committee considers that the maintenance of a large export trade in nitrogenous fertilisers should be an essential feature of post-war policy, since only in this manner could an economic use be found during peace time for an adequate reserve of plant for a future war emergency.

With regard to the possibility of rendering the United Kingdom self-supporting in nitrogen plants, the Committee reviews the prospects of the coal distillation industries, of low temperature carbonisation, and of the recovery of ammonia from shale, peat and sewage (p. 96-106 and Appendix III., p. 149-166).

Chart D



It is concluded, however, that while much could be done by the extension and development of ammonia recovery processes, a policy directed towards ultimate independence of imported nitrogen products would essentially involve the establishment in this country of nitrogen fixation on a large scale (p. 105).

Even if complete independence in peace time is not attempted the Committee is emphatically of the opinion that in the light of the lessons learned during the war the national interests demand the establishment forthwith of nitrogen fixation and allied processes upon a considerable manufacturing scale.

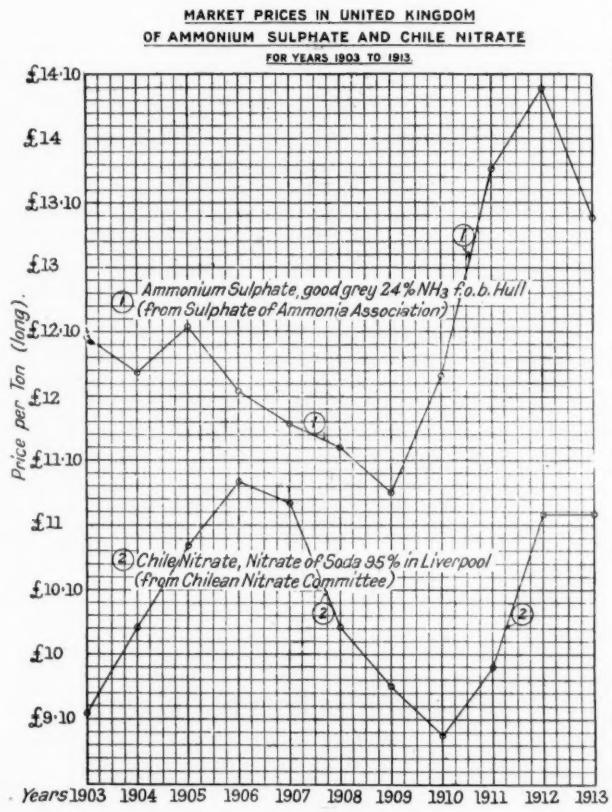
Nitrogen Fixation in the British Empire

The Committee deals with the nitrogen problem in Australia, Canada, Egypt, India, New Zealand, and South Africa, and comes to the conclusion that it would be practicable to make the British Empire during war and peace independent of external supplies of nitrogen products.

The Committee emphasises the fundamental change in the military situation that has been brought about by the commercial development of nitrogen fixation processes, and points out that this country cannot afford the risk of depen-

dence upon Chile in the future. It is urged that Imperial preparedness for defence is one of the vital problems to be faced, and should not be made subservient to commercial domestic requirements. The Committee advocates that an Imperial Authority should make a careful study of the defensive requirements of the Empire so as to decide which locations are most suitable for the establishment of the installation required to provide the necessary supplies (p. 119).

Chart E



Summary of Conclusions

The principal conclusions arrived at by the Committee are summarised on p. 120-133.

Recommendations

The Committee's recommendations are given on p. 133-137, and are summarised below :—

(I.) Provision for National Safety

The following measures are recommended as a minimum provision for safeguarding the future and for meeting a portion of the growing home demand for various nitrogen products.

(*a*) The establishment without delay of the calcium cyanamide process on a scale sufficient to give an output of about 60,000 tons of cyanamide per annum. This should be done either by private enterprise (supported if necessary by the Government) or as a public work, and the necessary electrical energy should be obtained either from water power in Scotland or from one of the proposed large steam power stations.

(*b*) The establishment forthwith of the synthetic ammonia process on a commercial unit scale and its expansion as rapidly as possible to a minimum manufacturing scale of 10,000 tons of ammonia per annum. The Committee recommends that the Billingham factory should be utilised for the purpose if such a course is practicable.

(*c*) The establishment of the ammonia oxidation process on a scale sufficient to produce about 10,000 tons of strong nitric acid per annum or its equivalent in nitrates.

(II.) By-Product Ammonia Industries

Various proposals are made for conserving and increasing the output of by-product ammonia from gasworks, coke ovens, &c.; for securing the better utilisation of the national resources in coal, and for reducing the consumption of *raw* coal as fuel. It is recommended that the Local Government be given wider powers in this connection.

(III.) Trial Operations and Research

The trial on a works scale of various promising processes for the fixation or recovery of nitrogen is advocated, and the Committee also recommends that the researches on the nitrogen problem initiated during the war should be continued under the auspices of the Government for the general benefit of the country. Further, that the results of the researches carried out up to the present date should be edited and published at the earliest possible moment.

(IV.) Imperial Supplies

The Committee recommend that a co-ordinated policy should be framed for safeguarding the future nitrogen requirements of the Empire, and suggest that Advisory Bodies should be set up in the various parts of the Empire to furnish the Imperial Authority with the requisite data.

(V.) Other Recommendations

Among additional recommendations, the Committee advocates the official collection and publication of comprehensive statistics for the nitrogen industries of the United Kingdom, and for the home consumption of coal by various classes of users and industries. The Committee suggest that the question of statistics is also worthy of the attention of the Overseas Governments.

Nitrogen Fixation as a Key Industry

Nitrogen fixation will constitute a new "Key" industry, and the Committee is of the opinion that its initiation and development will require the active support of the Government.

Natural Indigo

The demand for natural indigo which was revived by the war, and reached its high-water mark from 1916-1917, when 770,000 acres were under crop and yielded 95,700 cwt., has now ceased to a great extent, and it is announced from Calcutta that the final forecast of the production in India gives an area of only 233,800 acres and a production of 37,100. With the growing manufacture of synthetic dyes in England and America and the revival of the competition of German synthetic dyes, the industry is likely to have a struggle for existence, and its future largely depends upon scientific methods of increasing the yield per acre and organisation for competition in the international market. The problem before the industry is how to put on the market the natural product in the most acceptable form and at the cheapest price possible. It is worthy of note that the falling-off in area has occurred, not in Bihar, where a really well-organised industry exists and a superior grade of indigo is manufactured under European supervision, but in Madras and the United Provinces, where the temporary war spurt was the highest, and where the industry is mainly in the hands of small holders who are not in a position to brave the vicissitudes of the market.

In his review of the work of the past year at the eleventh meeting of the Board of Agriculture in India last month, Mr. J. MacKenna, Agricultural Adviser to the Government of India, referred to the introduction of the cess of one rupee per maund on all indigo exported from the country in order to provide funds for systematic scientific investigation. He stated that at present the proceeds are to be utilised in meeting a part of the expenditure for the Indigo Research Chemist, Mr. Davis, and also of the experimental and research work which is being done by the Indigo Committee in this country. A simple process of extraction of indican from the Java plant has been evolved, and it is hoped it will greatly simplify future work on indigo. The appointment of a botanist to investigate the possibility of increasing the indican content of the plant by means of selection has also been sanctioned. The past work of Mr. Davis has shown that great improvements can be made in methods of cultivation and extraction. As the last annual report on Indian agriculture observes, "if steps are taken to adopt at once such improvements as are clearly possible the future of natural indigo is by no means a hopeless one." Its fate will be determined by several factors, each of which has its own special importance. They are improvements by botanical selection, in agricultural methods, in chemical or bacteriological work in actual manufacture, and in methods of marketing.

Chemist's Prospects in India

(From a Correspondent.)

The voluminous but interesting report of the Indian Industrial Commission, published last year, emphasised very strongly the great need for organised and co-ordinated scientific research in India. That great country indeed offers an inexhaustible field for the chemist, and it is largely on the fundamental work which he will be called upon to do that the realisation of the visions of industrial expansion in India will depend. It will be remembered that the Commission collected an enormous amount of evidence, and found on all sides considerable enthusiasm in the possibility of India becoming a great industrial country. This enthusiasm was reflected in the Commission's report, and although there is no doubt as to the immense potentialities, it must nevertheless be borne in mind that the road to industrial greatness is not a smooth and easy one; it involves hard work, hard experience, and years of training. This is a truism to Englishmen, but many of the educated classes in India think that immediate results can be obtained by means of Government aids and grants in the formation of industrial companies and subsidies for scientific research. The new Board of Industries, of which Sir Thomas Holland is head, will have a very difficult task, which will not be rendered easier by the popular enthusiasm for a great industrial advance. The new-born zeal of the educated classes is not tempered with knowledge or with experience. The cry is for quick results and a deaf ear is turned to industrial history and teaching. As Sir Thomas Holland says "it will require a stiff back to work without distraction at the foundations whilst the public are shouting for a sight of the completed edifice."

There is no doubt, however, that under the strong and able guidance of Sir Thomas these foundations will be well and truly laid. No man has worked harder to gather up the loose ends of scientific organisation in India, and the extremely valuable work which he did during the war (and since) as chief of the Indian Munitions Board is well known. No one realises better than he the urgent need for closer co-operation and co-ordination among the various scattered and isolated scientific officers in India, and certainly he has worked very hard in the direction both of co-ordination and of expansion. Largely as a result of his efforts the Indian Government proposes to establish an All-India Scientific Service which will be mainly chemical to begin with. This proposal forms the subject of a Government Resolution (Indian Munitions Board), No. M.440, dated November 26, 1919. In paragraphs Nos. 116 to 118 of the report of the Indian Industrial Commission reference is made to the unsatisfactory nature of the present arrangements for the recruiting, employment and grouping of scientific research officers. It is very true that individual officers have done valuable work in their own special lines, and a certain amount of organisation has been achieved, as illustrated by the Geological Survey of India and the Indian Agricultural Service, including Forestry, but more co-ordination is needed and closer co-operation between the different branches of scientific inquiry. There is not only an entire absence, so to speak, of a scientific atmosphere, but also a lack of intercourse and of prospects of material advancement. The Indian Munitions Board certainly did its best to remedy this state of affairs so far as it was possible during war time, but the results obtained in this direction, especially under war conditions, were necessarily small compared with the vast field of possibilities. "The importance of organising scientific workers," says the above-mentioned Government resolution, "not only in the interests of the workers themselves, but of the work which they perform and of the public in whose interest they perform it, is now widely recognised; the question for consideration now appears to the Government of India to be the form of organisation best suited for Indian conditions." A scheme for the establishment of an All-India Service was outlined in the Industrial Commission's report, paragraphs 120 to 126, and received the sanction and approval of the Government (Despatch No. 15 (Industries), June 4, 1919; see also *Supplement to the Gazette of India*, November 29, 1919).

The Government has decided to deal in the first place with officers employed as chemists, and a committee has been appointed with the following terms of reference:—

1. To consider whether an All-India Chemical Service is the best and most suitable method of overcoming the difficulties and deficiencies pointed out by the Indian Industrial Commission.

2. If this is so, to devise terms of recruitment, employment and organisation; to indicate the extent to which chemists already in Government employ should be included in that service; and to suggest what should be the relations of the proposed organisation with the public and with Government Departments.

3. In particular, to frame proposals for the location, scope and organisation of institutions for chemical research.

The issue of the report of this Committee will be awaited with the keenest interest, and it is to be hoped that there will be no unnecessary delay. In view of the vast field for chemists in India there must be many who have turned their thoughts in the direction of our great Empire in the Orient as affording wide scope for their activities and ambitions. In looking over the terms of reference it strikes one as rather curious that it should be thought necessary to consider the extent to which chemists already in the Government service should be included in the new organisation. It seems only natural to suppose that these would be the very men to form the basis or nucleus of the All-India Chemical Service. The President of the Committee is Professor J. F. Thorpe, C.B.E., D.Sc., &c., of the Imperial College of Science and Technology, London; and the Secretary is Dr. J. L. Simonsen, F.I.C., Forest Chemist, Dehra Dun, India.

Pending the publication of the report of this Committee it seems only reasonable to hope that the position and prospects—at least of the chemists in Government employ—will be improved, but we shall, of course, be better able to judge when we see the report and the action taken thereon. Presumably, all chemists, whether in Government employ or not, will be invited to join. In regard to chemists not employed by Government but by private or joint-stock industrial concerns, especially if controlled by native directors, enthusiastic it may be but inexperienced, a word of caution will not be amiss. The chemist will naturally inquire very carefully into the constitution of the particular firm, and will for the present, at all events, prefer one that is mainly British.

Imperial College of Science

Claim to Grant Degrees

The claims of the Imperial College of Science to the right to grant its own degrees in science and engineering are forcibly stated in a letter to *The Times* of December 31, signed by a number of eminent men of science. With the growing importance attached to degrees, and their value to students in obtaining posts in the higher branches of industry and commerce, it should be within the reach of all to obtain such distinctions. It is pointed out that non-matriculated students are now debarred from the degrees of the London University, though these students may be just as efficient as those who have matriculated. They may have entered the College at a stage in their studies when it would have been sheer waste of time to attempt the matriculation examination, in which case they are unable to obtain a degree.

Sir Alfred Keogh, Rector of the Imperial College, points out that the limitation to universities of degree-giving powers is of no small importance. The nature of the certificate granted by educational bodies in these islands, he states, depends upon the official designation of the institution in which a graduate has been trained, and bears no relation to the quality of the education therein received. If the institution is termed a university the appropriate designation is Bachelor, Master, Doctor. If, on the other hand, the institution be a college, however great, however well staffed, however well equipped, the customary designation is Associate, Diplomate, Member, &c. This restriction imposed upon such colleges has far-reaching results. The average man assumes that the educational requirements of a university for a degree are higher than those for the diploma of a college, even of the highest rank, and so it comes about that in the competition for scientific posts a degree-possessing foreigner may easily obtain an advantage over the British diplomate. America and Germany possess certain degree-giving colleges of pure and applied science. Those colleges are great institutions and supply well-trained graduates for the industries of the world. But neither they nor the universities are in any sense more efficient than the recently established confederation of colleges (Royal College of Science, Royal School of Mines, City and Guilds (Engineering) College) in London known as the Imperial College of Science and Technology.

The French Turpentine Industry

Paper by M. André Joly

"THE French Turpentine Industry" was the subject of an illustrated lecture at the meeting of the Oil and Colour Chemists' Association on Thursday, January 8. Although M. André Joly, the author, was present, the lecture was read in English by Mr. A. E. de Waele.

M. Joly, after enumerating the resinous trees from which the gum —the origin of turpentine—is obtained in different parts of the world, said that the tree in ordinary use in France is the *pinus maritima*, and it is found chiefly in seaside districts and only in temperate climates. It is extremely common on the whole of the Mediterranean coast, and during the war the French were considering the possibility of making use of the trees in this region for extracting gum for the War Department. It is especially in the South-west of France—Gascony—however, that the most considerable plantations of these trees are found and, consequently, the factories, which number about 200, are also located in this district. The inhabitants of this district do not, in M. Joly's opinion, recognise the wealth in the *pinus maritima* plantations, for if the resinous industry in the Heath district were methodically and scientifically managed the output of marketable products could be greatly improved and outlets could be found for utilising the by-products.

Method of Obtaining the Gum

The *pinus maritima* covers an area of about 1,853,000 acres in Gascony, the western district lying between the Atlantic Ocean and the Garonne, and the growth of the tree is so rapid that it attains a diameter of nearly 1 ft. in 25 years, whilst the secretion of the gum is so abundant that in some cases extraction is carried out when the tree is barely 15 years old. The gum is obtained by means of incisions in the trunk of the tree, and the sizes of these incisions is regulated by the Forests Administration. They must not exceed 8 cm. to 9 cm. in width, and 65 cm. in height per annum, and the work of an incision is practically ended at the completion of the fifth year. The distribution of the incisions is also carried out with the greatest care. The first is usually formed on the thickest part of the tree which is on the east. It is dealt with for three or four years and it is carried on until the annual incision reaches a depth of 0·60 cm. The total depth must not exceed 1 cm. After a depth of 0·60 cm. has been reached the tree is given a rest for some years, and another incision is made at a regulated distance, and so on until eight incisions have been made, after which the tree is seldom touched again.

Turpentine Recovery

The gum of Bordeaux on an average contains oil of turpentine 18 per cent.; dry products, 70 per cent.; water, 10 per cent; and sand and impurities, 2 per cent. The first process in the recovery of turpentine from the gum is dealt with in a number of methods, the most ancient of which is a boiler with open top, in which the gum is melted very slowly with continual stirring. After clarification the boiler is emptied by a syphon, but a loss of 2 per cent. in oil is involved. To avoid this, a closed type of boiler is used in some factories which is provided with a stirrer. The raw gum is introduced into this boiler and heated to 80 or 90°C. at the end of three or four hours. The fire is then extinguished and the contents cooled by the addition of cold gum. Since the constitution of the oil is variable it follows that on its density being increased the separation of the water does not easily take place. Gabriel Col, therefore, conceived the idea of altering the density of the gum. With this object he adds to the gum contained in a mixer which is hermetically sealed and heated by steam, a quantity of oil of turpentine to the extent of 6 per cent., obtained from previous distillations. This mixer is connected with a spiral pipe which condenses the vapours given off when the mass is melted. The hot paste is then conducted into large vats for decantation, closed with a cover fitted with a hydraulic joint, and connected with a condenser. After 24 hours the mass is divided into three layers: the sand and heavy impurities, the water, and finally, the turpentine, which is then freed from its light impurities by sifting. In order to modify the difference between the density of the bodies to be separated, the density of the water contained in the gum is sometimes increased by the addition of a soluble salt. The operation is conducted in a boiler entirely closed, furnished with a stirrer and heated by steam. Another process consists of melting the gum in a closed boiler heated by steam, and, after sifting, transferring it direct by means of a steam juice-pump into the distillation apparatus.

By-Products

The solid residues arising from the purification of the gum still contain more or less considerable quantities of resinous products worth recovery, and various methods for making a direct extraction by means of special solvents or superheated steam, or for treating the residues with the object of transforming them into pitch or tar were described. The composition of turpentine was given as resinic acid, 64 per cent.; essential oils, 25 to 29 per cent.; resin, 5 to 6 per cent.; and various constituents, 1 to 2 per cent.

The manufacture of oil of turpentine was dealt with in considerable detail. The distillation of the gum, after purification, has for its object the separation of the volatile portions from the solid products. It is carried out in two ways: (1) distillation by direct heat, and (2) distillation in a current of steam. In spite of the numerous advantages of the latter process, it is at present used only in a very small number of factories. In the case of distillation by direct heat, use is made of a still of copper. During distillation warm water is injected into the still and the boiling point of the turpentine or purified gum is thus lowered, thus doing away with all superheating and enabling the product to be obtained in a purer state. On heating, the first portions of oil pass over with a little water, and then the liquid begins to boil. At this point, about 140°C. a small quantity of tepid water is introduced, but it is important that the temperature of the still be from 135° to 160°C., to enable the water to evaporate entirely and to avoid sudden jumps which, in certain cases, take the form of actual explosions. The distillation ends when the escape of oil of turpentine ceases. In certain factories use is made of an injection of steam simultaneously with the water, and this has the advantage of shortening the operation by about 50 per cent. In some factories distillation takes place without any preliminary purification, whilst in other factories a double preliminary purification takes place.

Distillaton in a current of steam enables the separation of the volatile products from the solids as completely as is done by the direct fire method with the additional advantage that the products obtained are purer, whilst in addition no special skill is required to do the work, and all danger is practically eliminated. Nevertheless, the Heath industries prefer to use the antique method, for the inadequate reason that it would involve the locking up of a large amount of capital to employ the more modern method. Devices for distilling by steam are fairly numerous, and the author of the Paper described two of them. The first consists of two still connected with a condensation apparatus. These stills are heated by steam, one being used for the distillation process, and the other for receiving the oil of turpentine obtained. The gum is introduced into the still and heated for about an hour and then left for the night. Meanwhile, the vapours set free are condensed by means of the condensing apparatus. The turpentine thus obtained is conducted into the second still where the oil is completely exhausted by means of an injection of steam at four or five atmospheres. The second device consists of a steam generator, a still and a condensation apparatus. The generator does not possess any special characteristic, but the still is made entirely of steel and is capable of supporting a pressure of 10 atmospheres. Its cover is provided with a tube through which the gum is supplied; another tube conducts the vapours into the condensing apparatus and there is a pipe at the bottom which allows of the escape of the resin. During distillation an injection of water is made through the dome. Finally, the residue is dealt with in order to obtain a pure resin, and in its thoroughly purified state is bleached by one of various processes. The oldest and most used method consists in exposing it to sunlight on sheet-iron trays. Almost complete bleaching is obtained in less than two weeks, and the same result is obtained by the action of ultra-violet light rays produced by mercury lamps.

Discussion

The CHAIRMAN (Mr. A. Molteni) congratulated M. Joly on an extremely interesting lecture, which had not only been of great scientific interest, but of great practical utility. He himself only used turpentine and could not possibly criticise M. Joly, who had evidently gone very deeply into the subject, but he would like to ask a few questions. He would first like to know whether there was any difference in the quality of turpentine and the yield in districts near the sea and those which were more inland. Such differences were noticeable, for instance, in the case of cocoa-nut oil extracted from cocoa-nut trees. He understood that turpentine when exposed to the air formed peroxides and oxidised with the formation of peroxides, and that further oxidation produced resiniferous bodies. Did these resiniferous bodies resemble resin, or in what way did they differ from it. It was a well-known fact that when subjected to the action of ozone, turpentine absorbed ozone very rapidly, and he would like to know whether the chemical compound produced was similar to that produced in the case of rubber.

Mr. H. MORGAN asked why the incisions in the tree were made at varying distances and in the form of a quadrilateral triangle inscribed within a larger one. Why were not the incisions made at equal distances. He had felt a little disappointed that the lecturer had not made some reference to the work of the pioneers in the work of the elucidation of the structure of turpentine. They would be found to be mostly English chemists, such as Tilden, who gave us our chloride re-action; Forster, who did so much in the synthesis of camphor; and W. H. Perkin, among others. Another point was that we heard a great deal nowadays about the application of science to British industry, and he felt it was almost refreshing—if he might use that term—to see that the French turpentine industry did not seem to have applied scientific methods any more than the British were supposed to have done. As the lecturer had pointed out, the question of locking up capital seemed to be regarded as more important than the exploitation of the industry on scientific lines.

The CHAIRMAN said there were not many of those present who were turpentine specialists, but they nevertheless thanked M. Joly very heartily for having given them such an interesting lecture. Although the French industry had not been placed on a very sound scientific basis, yet he thought it was a very well developed business all the same, and that the best use had been made of the pine tree.

The Author's Reply

Mr. DE WAELE, who replied for M. Joly, said it was difficult to obtain statistics in such a way as to be able to say whether the yield from trees near the sea and those further away was greater. The collection of the gum was in the hands of collectors and they were paid on the rather peculiar basis of half the receipts for the gum received from the factories. There were differences in the prices paid for the crude gum, but that was due to local differences in conditions of labour. Each tree produced annually only one litre. With regard to the oxidation of turpentine, and whether the resiniferous bodies were the same as those of resin, it had been well established that they were not. They were quite different. On the subject of ozonisation, apparently the chemical compound was identical with that from rubber. That work had been gone into very thoroughly and was dealt with in a German book which had recently been translated into French. With regard to the incisions in the tree, the trees were more strongly developed on the East side than the West on account of the climatic conditions and as the East side of the tree secreted more gum, there were more incisions on that side. M. Joly admitted having left out the names of workers in this branch, but he had considered that they were so easily obtainable in the standard text-books. He would, however, add a full bibliography in the *Journal* of the Association. He (Mr. de Waele) had asked M. Joly whether any work had been done with regard to the nature of the acids obtained by the oxidation of resin, but M. Joly was not aware of any. On the subject of bleaching resin, M. Joly wished him to say that he had omitted to mention the ozonisation of resin, but apparently very hard and exceedingly pale products could be obtained by this means, but the details were more or less rule of thumb. It had occurred to him (Mr. de Waele) that an exceedingly interesting Paper could be written on resin and its derivatives, and M. Joly said that he would be prepared to submit one to the Association on the subject.

A hearty vote of thanks was accorded the lecturer at the conclusion of the discussion.

"A New Instrument for Measuring Vapour Tension"

By Harold Moore, M.Sc.Tech., A.M.Inst.Pet.Tech.

MR. JOHN ALLAN presided over a crowded meeting of the Manchester Section of the Society of Chemical Industry, held at the Grand Hotel, Manchester, on Friday, January 9, when an important Paper by Mr. Harold Moore, M.Sc.Tech., A.M.Inst.Pet.Tech., was read on "A New Instrument for Measuring Vapour Tensions." The Paper gave results of the experimental work carried out by the author in regard to the determination of the volatility of motor spirits which had hitherto been carried out by the analytical process of fractional distillation. Although this test was undoubtedly an indication, it was not a direct measurement of the volatility. It therefore followed that it was only an indirect indication of the behaviour of the spirit in the engine.

Dealing with the details of his subject, Mr. Moore pointed out that in the jet carburetter of the present day the fuel was sprayed into the induction system and drawn into the cylinder partly in the state of gas-air mixture and partly in the form of a fine mist. The portion of the fuel which was not in the gaseous state was capable of being gasified by the heat of the cylinder (if the engine had been running), and further by the heat of compression. Thus, the ratio between the amounts of fuel in the liquid and in the gaseous state determined the ease of starting under standard conditions, and the "flexibility" of the engine while running at various loads and speeds.

The proportion of fuel volatilised was dependent upon the vapour tension of the fuel, and it was the vapour tension which required determination in the valuation of motor spirits by the analyst.

The Instrument Described

Mr. Moore stated that he had devised an instrument for readily ascertaining the vapour tension of motor spirits and motor spirit mixtures. This instrument consisted of two tubes of about ¼ in. bore and about 800 mm. long, and they were connected to each other and to a levelling bottle by means of a Y-piece and thick walled rubber tubing. The two tubes were clamped in a vertical position and were fitted with mercury-sealed cocks at their upper extremities. In order to allow of the regulation of the temperature one of the tubes was surrounded by a water jacket, the temperature being read from a thermometer suspended in the water jacket. When the levelling bottle was raised the two cocks opened, and mercury flooded into the cups attached to the cocks, and then the cocks were closed and the levelling bottle sufficiently lowered, two barometers being formed.

An explanation of the method of making a determination was then given. One cup was filled with motor spirit; a small amount, measured by a mark below the cock, was passed into the tube, and a sufficient amount of mercury afterwards placed in the cup to ensure an effective seal. The levelling bottle was lowered, and the barometric height read from the empty tube, while the tube containing the motor spirit gave a reading which was the barometric height minus the vapour pressure of the motor spirit at the temperature of the experiment. The difference in height between the two tubes gave the vapour pressure reading.

The tube used for the substance under test was the jacketted tube, and its temperature could be easily controlled. It was necessary for accurate readings to make a correction for the density of the mercury, but on the motor spirit tests in question this was not done, the quantity being considerably less than the normal experimental error.

The laws governing vapour tensions of mixed substances were somewhat complex, and a mixture of two soluble substances was liable to give a vapour tension either lower than those of either constituent or greater than those of either constituent, and might approach the sum of the vapour tensions of the substances at the given temperature. Cases in which the latter phenomenon was shown were of extreme importance to the student of motor fuels, as any method of raising vapour tension was of great value. In cases where the vapour tension exceeded the necessary value there might be found plenty of cheap fuels which could be added to bring about the necessary reduction in volatility.

A number of graphs were exhibited showing the vapour pressures of mixtures of alcohol-benzine and alcohol-petrol at various temperatures.

Discussion

Mr. THOMSON inquired how it was determined there was some permanent gas left from the petrol. He presumed there would always be a certain amount of vapour tension from the petrol. Assuming there was a very light body in connection with the petrol to the extent of 3 per cent., then in the event of its being 50 per cent. would the tension be about the same?

Dr. MORTON said that the permanent gas was dissolved, and by taking two readings on a barometric tube the amount dissolved could be calculated when dealing with a pure substance. If there was grease on the stop cocks had it any effect on the vapour pressure of the spirits dealt with?

Mr. STRAFFORD asked what method had been adopted for measuring the differences in the levels of the columns.

Mr. HAILSTONE asked if there was any difficulty in cleaning out the apparatus between the experiments.

Mr. GIBSON thought the stop cock question was a very difficult one. What guarantee had Mr. Moore that there were absolutely no leakages with these very light constituents? Also how would the curves be affected in the case of heavy constituents?

Capt. SINNATT asked if any experiment had been made with mixtures containing naphthaline.

The CHAIRMAN thought that Mr. Moore's instrument might prove of considerable usefulness in the case of solvent recovery processes.

Mr. MOORE, in the course of his reply, remarked that it was quite possible that some natural dissolved gas might come in through the distillation process and remain. He had not analysed the gas itself. There was no grease on the stop cocks of his instruments. Leakage was negligible and was merely of mercury, not air. The measurements were taken by a rule directly behind the instrument. The cleaning out of the instrument was done with another substance for testing which would be washed five or six times into the tube. By this means there was a complete replacement of the original substance by the further one. He had not prepared any curves of naphthaline mixtures. The presence of a small quantity of heavy substances did not appear to affect the readings appreciably. The result would appear in the fractional distillation.

Chemical Trade Dinner

WE learn that a chemical trade dinner is to be held at the Criterion Restaurant, London, on Thursday evening, February 12, and that the principal guests of the evening will be Lieut.-Colonel Sir Hamar Greenwood, M.P. (Parliamentary Secretary to the Department of Overseas Trade), and Sir William Clark (Comptroller-General of the Department). Sir Hamar Greenwood is expected to make some announcements of importance to all members of the trade. Although the arrangements are being made by the British Chemical Trade Association, the dinner will not be exclusively an Association function. All members of the trade are cordially invited, and it is hoped that there will be a large attendance to meet Sir Hamar Greenwood. Applications for tickets (10s. 6d. each) may be addressed to the Secretary of the Association, 80, Fenchurch Street, E.C.3, who will be glad to furnish any further particulars.

Industrial Chemists' Association

Demand for Minimum Salary of £250 per Annum

MR. E. L. BURT presided over a meeting of the Newcastle and District Section of the National Association of Industrial Chemists at Newcastle on Saturday, when resolutions for the forthcoming National Conference were discussed.

It was decided to put forward resolutions to the following effect: That the Executive Council be urged to formulate a programme which would include a demand for a minimum of £250 per year for qualified men; to attempt to secure exemption for the subscriptions of the Association to be assessed for Income Tax; and to attempt to secure a rebate of £25 for members for clothing, &c., as is done in several manual labour trade unions.

The Choice of Chemical Methods

Mr. J. W. Martindale, B.Sc., the local President, in a paper on "The Choice of Chemical Methods," said that they would agree that chemical analyses depended on the recognition of different elements and compounds by means of their properties and their behaviour with various re-agents. Quantitative analysis consisted in measuring the amount of substance (either element or compound) present in either of two ways: (1) by measuring the amount of re-agent used up by that substance in a chemical action, or (2) by collecting and weighing or measuring some product of the reaction of that substance with a re-agent. The cause of the chemical actions permitting those analyses did not immediately concern them; Bergman's "affinity" explanation was now discarded. The investigations into the heat involved in chemical actions had done much to satisfy curiosity in that direction. It was obvious that a reversible action was of no practical use to the analyst. The researches into the law of mass action had proved that by altering the relative masses of the reacting bodies the reversible actions could be made to proceed in one direction until one of the original substances was used up. What was not generally acknowledged was the fact that practically every reaction was capable of being reversed if the masses of the substances present were suitably altered. As an example, he gave $Na_2+Call_2 = NaCl+CaCO_3$ as a well-known "fixed" double decomposition. On the shores of certain Egyptian lakes, Na_2CO_3 was found formed by the reverse of the above action. The large excess of NaCl present in solution in the lake water accounted for that.

In most cases those facts were tacitly acknowledged by the analyst for, by experience, he discovered and added to his methods of analysis. The analyst found it necessary to state that certain of his methods were unreliable if more than a certain amount of the element present was sought. In gravimetric analysis the effect of reversibility of reaction was less often seen. The substance required was precipitated by a suitable excess of reagent in suitable bulk of liquor. Only by long experience was the correct excess required and the correct concentration of the liquors discovered for each process. The formation of a precipitant as a product of the reaction naturally removed one substance from the sphere of operations and prevented the reverse action. The errors of concentration caused a good deal of trouble. He quoted an example of a good analyst estimating Mg satisfactorily on 1 g. sample in many refractories. In a magnesite brick, using the same method, he obtained 30 per cent. of Mg instead of over 80 per cent.! The method was apparently unreliable for high per cent. Mg. An adjustment of concentrations was worked out and it was found necessary to use not more than 0·25 g. sample if the bulk of liquor was not to exceed 1,000 ccs. An estimation on 0·5 g. yielded about 70 per cent. Mg. In a volumetric analysis it was obvious that in a titration one should be as free as possible from reversible reactions and from the need for adding an appreciable excess of reagent. As far as possible, titrations were confined to reactions where a reverse action was not possible to any appreciable extent, unless huge excess of the original material was present. In certain cases, where possible, the burette reagent was made of suitable strength to avoid more than negligible error. Unfortunately, one was forced to use several reactions where error could creep in. The best illustration occurring to him was the iodine and thiosulphate titration with starch solution as indicator.

Mr. Martindale dealt at length with the various methods of analysis which were better known and with others that had come under his notice. Amongst these was an ingenious system of analysis which he described. By having all substances put up in fixed quantities analysis became easy. Instructions ran: "— add contents of blue packet, boil, allow to cool, add contents of white packet, &c." As, of course, the quantities in each packet were carefully calculated no trouble would be experienced. He could thus conceive a youth doing Mn in steels by such a method with success, providing each steel had the same amount of Mn in it. The method would, however, defeat its own ends if an unusual amount of Mn were present, for a wrong result would probably be obtained. Wrong results, concluded Mr. Martindale, were not so terrible unless they were achieved by a method assumed to be infallible.

Chemical Technology of the Tannins

THE Chemical Technology of the Tannins was the subject of a lecture given by Dr. Nierenstein to the Bristol and S. Wales section of the Society of Chemical Industry, last Thursday, January 8. The ancient industry of tanning involving the use of a class of substance known as the tannins has a large local interest. The industry has not followed the rapid developments of other industries. Methods in vogue to-day are paralleled in those of ancient Egypt.

The vegetable tannins formed the main subject of the lecture. They are drawn from all corners of the world and have queer names, such as Quebracho, Knoppern, the actual material employed in tanning being extracted from these raw materials after they have been finely divided in some way. The value of the natural tanning material depends on the tannin content. The determination of this substance in the raw material is a matter of importance to the tanner. The analytical methods in use were reviewed by the lecturer. The hide powder method was criticised particularly, it being pointed out that this method seemed to form a kind of sacred ritual to the chemist dealing with tannins.

Dr. Nierenstein had worked on tannins for nearly 20 years and found that the subject was practically untouched; but certain main points had arisen as the result of his work, one being that unless tanning material contained a certain group with other groups arranged in proper position about it, it would not coagulate gelatine and would, therefore, fail as a tanning agent. This work has been reproduced by Emil Fischer at a much later date, but the work of Fischer, which has been much advertised, has added nothing to progress in the subject.

The classification of the tannins is not satisfactory, leading to many anomalies. It requires careful revision, but the time is hardly ripe for it, as although Dr. Nierenstein with his pupils have been engaged on the work many years, only the fringe of the subject has been dealt with.

In the discussion which followed Messrs. Walls, O'Brien, Boucher, Bernard, Eberle and Drs. Butler and Fis her took part.

The next lecture will be on "Cement," by Mr. J. V. Watts.

The Baku Naphtha Industry

ACCORDING to M. T. Bjelosjersky, delegate of the Permanent Council of the Naphtha Industry Association of Baku, the total production of naphtha in Russia in 1917 was 531,800,000 poods (pood equals 36 lb.). Of this total Baku contributed 402·8, Grosny 110, Emba 15·5, Maikop 2, and Tscheleken Island 1 million poods. In 1918 the output from Baku was not more than 200 million poods, whilst the supply from Grosny was also considerably reduced, owing to some of the naphtha plants having been destroyed in 1917. The same applies to Emba, Maikop and Tscheleken. For the next year or two at least the Russian production of naphtha will not exceed 350 to 400 million poods, which, reckinong 1,000 poods as approximately equal to 16 tons, represents 5,600,000 to 6,000,000 tons. The industry is badly in need of better transport facilities, also of general equipment, machinery and labour. It is thought possible that new sources of naphtha may be discovered in the Baku district, especially when the work of reclaiming or draining the Bibi-Eibat Bay is completed, to the cost of which the naphtha industry has already contributed 6,000,000 roubles. The working costs of the naphtha industry have naturally risen very considerably. Before the war a deep bore cost from 200,000 to 300,000 roubles, but now, according to a recent estimate of a firm engaged in the work, the cost of boring to a depth of 300 sashen (2,100 ft.) is 975,000 roubles and the usual labour unrest is prevalent also in this part of the world.

Trade in 1919

THE Board of Trade returns to hand yesterday are of especial interest, as they furnish the figures for the year 1919. Imports for the 12 months amounted to £1,631,902,000, an increase of £315,751,000 on the year 1918, equal to 23.9 per cent. British exports amounted to £798,373,000, an increase of £296,954,000, equal to 59.2 per cent., and re-exports amounted to £164,322,000, an increase of £133,377,000, or as much as 431 per cent. in excess of the total for the last war year. Taking the month of December alone, the returns show values of imports and exports, exceeding all previous records. Imports at £169,735,000 exceeded those of December, 1918, by 53½ millions, and surpassed the November, 1919, total by over 26 millions. Exports at £90,858,000 were 52½ millions ahead of December, 1918, and represent an improvement of 3½ millions upon November, 1919, despite the fact that the past month contained one working day less.

Books Received

THE DYEING INDUSTRY. By S. H. Higgins. Manchester University Press. Pp. 189+22. 8s. 6d. net.

MEMOIRS OF THE COLLEGE OF ENGINEERING, IMPERIAL UNIVERSITY, KYOTO, JAPAN. Vol. II. Nos. 1, 2, 3 and 4. Kyoto University. Pp. 100.

The Affairs of J. A. Hanley

AT the Leeds (Yorks.) Bankruptcy Court, on Monday, James Alec Hanley, described as an agricultural chemist, residing at 5, Woodsley Terrace, Hyde Park, applied for his discharge from bankruptcy.

Mr. Clifford Bowling (the Official Receiver) stated that the liabilities were estimated to rank for dividend at £975 1s. 10d., of which there was proof for £516 6s. 7d. The assets, though estimated at £50, realised £90, being sufficient to pay a dividend of 1s. in the £.

At the date of the receiving order the debtor was employed as an agricultural chemist at the Leeds University. Up to the outbreak of war he was engaged upon research work at the University of London and Munich. He was then employed for about three months on experimental farming, and about 4½ years ago obtained an appointment at the salary of £150, which had gradually risen to £374. He attributed his financial difficulties to his wife, who had contracted most of the debts without his knowledge. It was stated that the wife represented herself to be entitled under her father's will to an annual income of about £1,000 and that on this and other plausible representations she had obtained some £1,000 in 15 months from two persons. It was only by accident that Dr. Hanley discovered last September that a large number of documents had been successfully intercepted by his wife, who had now disappeared.

Mr. Willey, for the debtor, said that he was confident that Mr. Hanley was on his way to fame at the Leeds University, and he asked Judge McCarthy to consent to judgment and give him his discharge for the payment of £100.

The Official Receiver: I think the suggestion is not unreasonable.

The Judge agreed to Mr. Willey's suggestion and Mr. Hanley was granted his discharge subject to his entering into judgment for £100 to be paid in a month.

Sale of a Chemical Business

MR. JUSTICE ROCHE, in the King's Bench Division Commercial Court, on Monday, had before him third party proceedings arising out of the action Produce Brokers Co., Ltd., of St. Mary Axe, against Messrs. Widenmann, Broicher & Co., Ltd., of Crutched Friars; Mr. P. D. Leake, accountant, of Abchurch Lane, and Messrs. Cowan Brothers, Ltd., of Crutched Friars and Stratford. The dispute arose out of the sale of a chemical business, and defendants, Widenmann and Broicher, claimed to be indemnified by Messrs. Cowan, Brothers.

According to Mr. Barrington Ward, K.C., judgment was given in the action for the Produce Brokers for £8,504. 7s. 7d., damages against Widenmann and Broicher, but his Lordship found in favour of Mr. Leake and Messrs. Cowan, and remarked that there was no reason why there should not be third party proceedings afterwards. These had become necessary and an indemnity was sought against Cowan Brothers for the sum awarded and for costs incurred. The answer was that not only had the third party a good defence, but they put in a counterclaim. The business was sold to Messrs. Cowan Brothers by the defendant Leake on behalf of Widenmann and Broicher, and it was contended that at the time of the sale Leake verbally warranted that there was a profit on the business of £6,718 as estimated from the balance sheet of profit and loss account.

Mr. Raeburn, K.C., for Messrs. Cowan Brothers, said he claimed damages against Leake and Widenmann and Broicher for alleged breach of a warranty in respect of the sale of the business. Messrs. Widenmann and Broicher carried on business in London and elsewhere for the purchase of chemicals, and the constitution of the company was such that under the Trading with the Enemy Acts it was considered proper by the authorities first to inspect, then to supervise, then to control, and finally to liquidate the business. These duties were performed by Leake, who was appointed liquidator. Messrs. Cowan purchased the business for £15,000, the balance-sheet and the profit and loss account for the year showing a trade profit of £6,768. When, however, Messrs. Cowan Brothers began to make up their balance-sheet they found that instead of a profit there was a loss. They began to look into matters and found that in the profit and loss account of 1918, instead of there being a profit of £6,000, there ought to have been a considerable loss for the reason that there had been an omission to debit against credits received in respect of sales the price paid for the goods. The result was that instead of there being a profit of £6,700, there was a loss of about £3,000.

After consultation between Counsel, Mr. Barrington Ward stated that an arrangement had been arrived at between the parties, who agreed to judgment for the indemnity against Messrs. Cowan Brothers with costs, and with liberty to apply when the amount of costs was ascertained. Messrs. Cowan admitted that no warranty, as alleged, was given by Mr. Leake.

Mr. Raeburn also stated that his clients agreed that no verbal warranty was made by Mr. Leake.

The question as to the fair price for the business was left to the Judge who deals with applications under the Trading with the Enemy Act.

Nitrogen for Fertiliser Purposes

Lecture by Mr. G. A. Cowie

BEFORE the members of the Wadhurst Farmers' Club a lecture was given on Tuesday evening last by Mr. G. A. Cowie, M.A., B.Sc., A.I.C. The lecturer having referred to the three chief processes now used commercially for the fixation of atmospheric nitrogen for fertiliser and other purposes (the Haber process, the cyanamide process and the arc process), said it was important not to confuse the two products, nitrolim and nitrate of lime. Nitrolim was manufactured from carbide of lime and nitrogen gas. Nitrate of lime was manufactured by the direct oxidation of the nitrogen of the air by passing the latter through an electric arc flame at a temperature of about 3,500°C. In nitrolim the nitrogen was actually present in an organic form, viz., as cyanamide—and had to undergo at least three changes in the soil before it became available as nitrate to the crop. Nitrate of lime, on the other hand, contained its nitrogen in the identical form in which plants were assumed to take up their nitrogen. Generally speaking, nitrolim in its rate of action corresponded more to sulphate of ammonia and nitrate of lime to nitrate of soda.

Speaking more particularly about nitrate of lime, the lecturer pointed out the remarkable developments in this industry, especially since the commencement of the war. The industry was only started in 1905, and the production had now reached a total of something like 186,000 tons a year. The unprecedented demand for nitrates created by the war was responsible for a rapid extension of the works, and it redounded greatly to the credit of the Norwegian Company that they decided at the very outset of hostilities to place their production at the disposal of the Allies. These supplies of nitrates were now mainly available as fertilisers and chiefly in the form of nitrate of lime.

The commercial success of this industry in Norway was rendered possible by the cheap electric power obtained by the harnessing of the natural waterfalls in that country. Unique enterprise had been shown in the harnessing and utilisation of the power. The first factory was opened at Notodden in 1905, but the chief centre of the industry was now at Rjukan, which can boast of possessing the largest water-power station in the world. Altogether, a total of 300,000 H.P. to 350,000 H.P. was now utilised in this industry.

It was also a remarkable fact that the use of nitrate of lime as a fertiliser has kept well abreast of its production. In 1909 the total amount used was little more than 1,000 tons, while the quantity sold forward for the coming season amounted approximately to 150,000 tons. In Scandinavia nitrate of lime was becoming increasingly popular, and was generally much preferred in Norway to any other source of nitrogen. The production of nitrate of lime in a granular form was an important advance, and would lead to its wider use in this country.

Grays Chemical Works, Ltd.

The creditors interested in the company's voluntary liquidation were called together on Monday. The chair was occupied by Mr. A. N. Harper, who reminded the creditors that the shareholders had passed the usual resolution for voluntary liquidation, and had appointed him liquidator. Mr. H. V. Thurgood had been appointed to act as receiver for the debenture holders, and had taken possession of the assets. The liquidator added that he had not been able to prepare a statement of affairs, but he had the last balance-sheet; this showed total liabilities of £41,400, including the share capital, the principal items being: Loan from bank, £7,711; debentures, £5,049; unsecured loans, £2,170; sundry creditors, £8,388; Gray's Dyes & Co., Ltd., £1,750; overdraft at bank, £631; and bills payable, £249. The assets of the company were valued in the balance-sheet at nearly £30,000, the principal items being plant and machinery, £23,085; stocks on hand, £3,163; and sundry debtors. The balance-sheet also showed accumulated losses on the trading of rather more than £12,000. The Chairman referred to a trading account which he had received from the Receiver. The account showed receipts of £2,408, out of which had to come the expenses of running the business, while £1,000 had been paid off the debentures, and there was a cash balance in hand of £630. After a short discussion, the meeting decided to confirm the voluntary liquidation of the company, but decided that the creditors should be represented in the liquidation.

Catalogues Received

CHEMICALS.—A short list of products supplied by the firm in their various groups, including technical chemicals, fine chemicals and pharmaceutical preparations, alkaloids, photographic chemicals, synthetics and essences, oils, drugs, liquid and solid extracts, colouring matters, &c. The catalogue is accompanied by a useful wall calendar for 1920, one page being devoted to each month. Mangold Bros., London, E.C.3. Pp. 4.

A Three Million Glass Combine

FOLLOWING upon statements respecting glass amalgamations it was officially announced on Wednesday that British Glass Industries, Ltd., have acquired 76 per cent. of the ordinary share capital in United Glass Bottle Manufacturers, Ltd., and have made an offer to the shareholders in that company to purchase the balance of the ordinary share capital. United Glass Bottle Manufacturers, Ltd., own the entire share capital of the following companies: Cannington, Shaw & Co., Ltd., St. Helens; Nuttall & Co., Ltd., St. Helens; Robert Candlish & Son, Ltd., Leaham; Alfred Alexander & Co., Ltd., Hunslet, Leeds; Aire & Calder Glass Bottle Works (E. Breffit & Co., Ltd.), Castleford; and Moore, Nettlefold Co., Ltd., Woolwich; and a large modern glass works is now being erected by United Glass Bottle Manufacturers, Ltd., at Charlton, Kent. In addition to other glass products these companies now produce over 150,000,000 bottles per annum, and will be gradually increasing their production, so that by the end of 1920 it should reach 250,000,000 bottles per annum.

Mr. George Edward Alexander, director of United Glass Bottle Manufacturers, Ltd., and chairman of the British Association of Glass Bottle Manufacturers, Ltd., is joining the board of British Glass Industries, Ltd. This purchase is entirely independent of the transaction concluded with the United Glass Bottle Manufacturers, Ltd., announced a few days ago, and the two operations, together with developments and extensions of existing works, will involve a sum of approximately £3,000,000.

Discussing the subject of the deal, Sir Francis Towle, a director of the Commercial Bank of London and British Glass Industries, Ltd., said that the fusion of interests had taken place not with a view in any sense to raising prices, but with the view ultimately of being able to lower prices by reducing the management and overhead charges. There was also the object of enabling a newly-resuscitated industry to compete with foreign imports, which would no doubt be a very serious matter when the countries settled down. "This amalgamation," Sir Francis continued, "possesses the patents of practically the whole of the modern automatic machinery for making glassware of every kind, including bottles, jars and window glass. The demand for glass in the next few years will be enormous, and it is the ambition of the British glass industries to be able to meet the requirements of the United Kingdom and afterwards enter the world's markets to compete with foreign-made glass. It is going to give employment to thousands of British citizens who could not be employed before owing to there being no industry of the kind in the country. The glass industry is passing through a very remarkable phase—it is changing from a handicraft to a mechanical manufacture, and just as machinery has revolutionised every other trade, undoubtedly machinery will revolutionise the glass trade."

Lever Brothers Co-Partnership Scheme

LORD LEVERHULME, who is now travelling abroad, has written from Vancouver to the *Liverpool Daily Post* with reference to Lever Brothers' co-partnership scheme, which the Amalgamated Society of Carpenters and Joiners took objection to so far as it affected their members working at Port Sunlight. In a statement by an official of the Amalgamated Society of Carpenters and Joiners, it was stated: "To real co-partnership, which involves joint control, we have no objection; but as practised to-day it is merely a bonus on production, which is payment by results—in other words, piece work."

This statement, Lord Leverhulme writes, is absolutely without foundation. Eighty per cent. of the directors on the board of Lever Brothers are co-partners, and over 80 per cent. of the managers, assistant managers and foremen are also co-partners. The business of Lever Brothers is managed by co-partners, whose votes as directors and on committees have equal value with other votes, and outnumber all other votes in the proportion of four to one. Neither myself nor my son possesses any special voting power. Whatever influence we possess is founded upon the confidence reposed in us by co-directors, co-partners, shareholders and staff, and we would not have our power or influence rest on any other foundation. Lever Brothers' co-partnership scheme is not "merely a bonus on production." It is an equitable and fair division of the profits between the shareholders and the co-partners, with an ever-increasing proportion going to the co-partners.

I have often been asked by trade unionists to admit "outside" trade union officials to a seat on the board of Lever Brothers. My answer to this has always been to ask whether trade unions would admit directors of Lever Brothers to a seat on the committees of trade unions. To the latter I have always had a most emphatic refusal, and I am confident that unless the members of trade unions felt confident that the admission of a director of Lever Brothers to a position on a trade union committee would strengthen trade unionism, and enable the union the better to discharge its duties to its members, that an invitation to a seat on the board could no more be extended to a director of Lever Brothers than could, vice versa, an invitation be extended by my colleagues and myself to trade union officials to a seat on the board of Lever Brothers, unless trade union officials would join wholeheartedly and sincerely with the firm to reduce costs of production by increasing output and better service to the consumers. Only on these lines can a board of directors maintain a progressive policy, increasing wages whilst reducing hours of labour as a result of lower cost of production and lower selling prices to the consumer. A trade union occupies its right and proper place, and so does a board of directors, and there must be no confusion in their respective duties, or of the obligations devolving upon either

Allen Harding & Co., Ltd.

A LARGELY attended meeting of the creditors of Allen Harding & Co., Ltd., 1, Leadenhall Street, E.C.3, and at Deptford, chemical manufacturers, in voluntary liquidation, was held on January 12. The chair was occupied by Mr. E. C. Moore.

Mr. Stanley Stone (Swepstone, Stone & Co., solicitors to the company) said the firm was started about 1906, and carried on business in a comparatively small way until 1914. Just prior to the outbreak of war the business began to improve, and after the war it increased still more rapidly. In 1915 a private limited liability company was formed with a nominal capital of £25,000, that sum representing the goodwill, stock and other assets transferred by the firm. After 1915 the business increased by leaps and bounds. Department after department was opened, until in 1919 the turnover was at the rate of over a million a year, and the business generally showed a profit. Up to 1906 a claim was made for excess profits duty amounting to £11,000. That assessment was unsuccessfully appealed against. The company entered into a contract with Messrs. Kirsch, of New York, to take large quantities of goods, but when the articles finally arrived in this country dealings in them had been prohibited by the Government. The company had opened credits in New York to the extent of £190,000, and had re-sold the goods to merchants in this country. A Mr. Mason had bought large quantities of the goods, and he made a claim against the company for £27,000 for damages because the company had not delivered to him. Arbitration proceedings took place in connection with that claim, and, although the proceedings had terminated, he did not yet know what the result was. The proceedings cost the company about £1,000. After Messrs. Kirsch had delivered the goods, they claimed that the company had entered into further contracts, under which they ought to have opened additional credits, but had not done so. The company contended that the credits were not to be opened until after the goods contracted for had been delivered, and that, as they did not arrive in this country until after dealings were prohibited, they could not open the fresh credits. Messrs. Kirsch made a claim against the company of about £29,000 on that account. The action came on for hearing before Mr. Justice Roche, who decided against the contention of Allen Harding & Co., Ltd., and it was held that the company were bound to open the credits, although the Food Controller had said they were not to do so. Messrs. Kirsch recovered judgment for £21,000 and costs. Notice of appeal had been given and the matter was still pending.

The Chairman then submitted an approximate statement of affairs, which showed gross liabilities of £154,050 5s. 8d., of which £82,509 10s. 5d. were expected to rank as unsecured. There were some 356 trade creditors, whose claims aggregated £47,383 3s. 1d. The claims of the fully secured creditors amounted to £46,086 18s. 1d., the securities held being estimated at £47,540 16s. 11d. There were also partly secured creditors for £52,803 9s. 6d., the securities being valued at £24,827. 2s. 2d., thus leaving £27,976 7s. 4d. to rank as unsecured. It was not anticipated that there would be any liabilities on bills discounted, but there were other contingent liabilities, of which it was expected that £7,150 would rank for dividend. The assets were estimated to realise £26,908 10s. 9d., from which had to be deducted £626 15s. for preferential claims, leaving net assets of £26,282 4s. 9d., or a deficiency as regarded the unsecured creditors of £56,227 5s. 8d. The issued share capital of the company was £25,000, and as regarded the contributories there was a deficiency of £81,227. 5s. 8d. Messrs. Kirsch had been scheduled as partly secured creditors in view of the fact that they had levied execution. He had prepared a deficiency account, which showed a total of £79,540, whereas the deficiency in the statements of affairs only amounted to £56,227. Those figures were reconciled by the profit of over £20,000 which the company had made during the last three years. Up to November of last year the company was doing well. Owing to the action the company lost its credit, and the net result was that the present deficiency arose.

A resolution was proposed for the continuation of the voluntary liquidation, with Mr. Moore as liquidator; but this course was opposed by Mr. Hamilton, who stated that he was a creditor for some £20,000, most of which had been incurred during the past few months. There had been many subsidiary companies, and it was essential that they should have a joint liquidator.

After a short discussion, during which it was stated that Messrs. Andorsen, Becker & Co. had presented a petition for compulsory liquidation, it was decided that the voluntary liquidation should be continued, with the chairman and Mr. B. Mayhew as joint liquidators. A committee of inspection of five of the principal creditors was also appointed. The petitioning creditor stated that they were in favour of the course proposed, and on the hearing of the petition they would apply for leave to amend, and ask for the appointment of the joint liquidator.

From Week to Week

SWANSEA HARBOUR TRUST EXECUTIVE COMMITTEE have approved new bye-laws for the discharge and loading of petroleum at the docks.

THE SCIENTIFIC INSTRUMENT, Glassware and Potash Production Section of the Board of Trade has been transferred from 7, Seamore Place, W.1, to the main offices at Great George Street, S.W.1.

SIR EDWARD BROTHERTON, M.P., has promised a gift of £1,500 to the fund for increasing the endowment of poor benefices in the diocese of Ripon.

THE DAMAGE by fire and water at Messrs. Burgess, Ledward & Co.'s mill, Walkden, on Saturday, when the dyeworks were destroyed, has been roughly estimated at £500,000.

THE JOURNAL of the Board of Agriculture states that it has been proved by recent experience that the most effective poisons for rats are preparations of carbonate of barium and red squills.

DR. H. T. CALVERT, Deputy-Chief Inspector of the West Riding of Yorkshire Rivers Board, has been appointed Chemical Inspector in the Engineering Department of the Ministry of Health.

ACCORDING to the *Giornale d'Italia*, the recently-discovered phosphate mines between Derna and Cerene are probably the richest and most extensive in the world.

THE SUM OF £1,571. 9s. 5d., given or promised by donors in Holland. has been received by the Ramsay Memorial Fund from Professor H. Kamerlingh Ounes.

ON FRIDAY, January 9, a fire broke out at the works of J. Waddington & Sons, dyers, Leeds, and about 20 tons of timber and a wood beam in a yard adjoining the works were damaged.

INFORMATION has been received from the Disposal Board of the Ministry of Munitions that they are unable to accept any further orders for ammonium nitrate as fertilisers, though quotations are still given by some merchants.

FORMERLY A COTTON WEAVER at Burnley, Miss Jane Lancaster has gained the London University Degree of B.Sc. She has been admitted an Associate of the Institute of Chemistry, and holds the post of analytical and research chemist with a large industrial firm.

AT A PUBLIC MEETING of protest against the dismissal of employees at the soap works of Watson & Sons, Ltd., Leeds, one of Lever Brothers' associated companies, held in Leeds on Thursday, January 8, a resolution was adopted for submission to Lord Leverhulme.

THE INDUSTRIAL COURT has granted an advance of 5s. per week to adult general workers employed in the oil-milling and seed-crushing industry. The claim by the National Federation of General Workers was for an increase of 10s. per week for men and women over 18, and 8s. for workers under 18.

IT IS PROPOSED to establish a research institute in Edinburgh in memory of the late Lord Lister. A suitable site has been secured near the Royal Infirmary and the Medical School of the University at a cost of £50,000. Altogether a sum of at least £250,000 will be required.

LECTURING at Middlesbrough on Thursday, January 8, Dr. J. E. Stead, F.R.S., said the main constituents of Cleveland ironstone were water, clay matter and ironstone proper, which was iron-oxide combined with carbonic acid; and that for every ton of pig-iron produced in the Cleveland blast furances, no less than 4½ tons of carbonic acid gas were thrown into the air.

THE PROGRAMME of forthcoming meetings issued by the Institute of Metals includes interesting information with regard to the local branches of the Institute. The membership is now over 1,200, and applications are being received so rapidly by Mr. Shaw Scott, the secretary, at 36, Victoria Street, S.W.1, that the forthcoming ballot on March 3 is likely to constitute a record.

ACCORDING TO *Stubbs' Weekly Gazette*, the failures in the United Kingdom up to January 10, 1920, were 36, an increase of 11. The numbers of bills of sale registered and re-registered was 172, an increase of 85. Mortgages and charges registered by limited companies amount to £828,685, the amount authorised (where stated) being £232,362.

WE HAVE RECEIVED a letter from Dr. Charles H. Herty, editor of *The Journal of Industrial & Engineering Chemistry*, who was recently on a visit to Germany in connection with the dye situation, expressing his regret that the necessity for an early return to America compelled him to abandon his intention of visiting London, and personally meeting leading representatives of British chemical industry.

AN ARMY COUNCIL INSTRUCTION states that, owing to the unstable nature of hydrogen peroxide solution, the difficulty of obtaining and the cost of suitable containers, the excessive loss by bursting and leakage, the great bulk of the liquid, and the high cost of transport, the supply of hydrogen peroxide to military hospitals will be limited to cases which cannot be satisfactorily treated by some other antiseptic.

THE BOARD OF TRADE have issued, in the form of a Parliamentary Paper [Cmd. 512], notes on trading conditions as affected by the raising of the blockade, the authorisation of the resumption of trade with Germany and other countries, and the removal of United Kingdom import restrictions. These notes supersede those published in July and September last as Parliamentary Returns "Cmd. 274" and "Cmd. 350."

AN INJUNCTION, with £10 10s. costs, was granted against Messrs. Tunstall & Co., Ltd., tar distillers, of Newlay, on January 9, at the Leeds Police Court, to restrain them from tipping ashes on to a bank at their premises in such a manner that they fell into the River Aire. Mr. J. Milner, defending, said that the ashes were put down for the purpose of reclaiming those portions of the defendant's land which were under water and also to prevent further erosion.

IN CONNECTION with the Somerset "Port Sunlight," which is to be established on a site 150 acres in extent at Newton St. Loe, near Bath, it is understood that Messrs. Christopher Thomas, Ltd., the Bristol soap and candle firm, who are associated with Messrs. Lever Brothers, are responsible for the project, the effect of which will be to double their works and the number of their workpeople The garden village will comprise houses for about 6,000 workpeople.

SIR JOHN MILLS MCCALLUM, Liberal member for Paisley, and Chairman of the firm of Isdale & McCallum, soap manufacturers, Paisley, died on Saturday, January 10, at the age of 72 years. The son of Mr. John McCallum, a Paisley dyer, Sir John took an active interest in public affairs, and was a magistrate and a member of the Town Council for many years. He first stood for Paisley in 1906, when, as a Liberal, he secured a majority of 3,070 over the Liberal Unionist candidate, and had retained the seat ever since.

THE COURT OF APPEAL on Monday heard an application on behalf of Sir Alfred Mond in connection with the libel action which he brought against Mr. Henry MacLeod Fraser and Mr. Henry Hamilton Beamish. Mr. Beamish had given notice of appeal, and the present application was that Mr. Beamish should be ordered to give security for costs of his appeal. Their Lordships made an order for security for £100, to be given within six weeks, and gave Mr. Beamish liberty to appeal, and stayed all proceedings meanwhile.

SATISFACTORY PROGRESS in regard to the training of ex-service disabled men is reported by the Divisional Director for the West Midland area. The total number in training in Birmingham is 922, and in June an exhibition of their work is to be held at the Town Hall; it will be opened by Sir Robert Horne, Minister of Labour. Fifteen ex-Service men are in training as laboratory assistants to industrial chemists; 16 are learning glass making; and classes are well attended in brush-making and stained-glass window work.

THE DEPARTMENT OF OVERSEAS TRADE advise British firms established in the United Kingdom who are sending representatives to South Russia for the future to furnish such representatives with letters or certificates to the effect that the firm is British, and that the person is representing British commercial interests. These letters or certificates should be addressed by the firm direct to the British consular officer at the port or town visited by the traveller, and handed to the latter for presentation to such officer.

NEGOTIATIONS ARE NEARING COMPLETION for a change of management which will bring the mineral wealth of Westmorland under extensive development (says the *Observer*). Mr. Reynoldson, who has held the mineral rights under Lord Hothfield and Mrs. Breeks, is disposing of them, subject to manorial rights, to Sir Hugh Bell and a group of Middlesbrough ironmasters, who intend to construct a mineral railway from the summit of the Pennines to Warcop, via Brough, to deal with the limestone and barytes, of which there are immense deposits.

IN AN ARTICLE on "British Dyes Supply" in *The Times* last week, the author points out that the shortage of most of the dyes about which complaints have been most insistent is not due to the British manufacturers' lack of knowledge of how to produce them, but to lack of plant. When the plant is forthcoming the dyes can be made. It must be remembered, he states, that for the smallest item of chemical plant, five to seven months, or even longer, is taken for delivery. The moulders' strike, which has lasted nearly four months, has, during that time, prevented the delivery of castings, and the consequence has been a paralysis of new construction.

A THREE DAYS' EXHIBITION of Foreign Samples, organised conjointly by the Liverpool Chamber of Commerce and the Department of Overseas Trade, is being opened to-day (Saturday) in the Concert Room of St. George's Hall, Liverpool. The exhibition will consist of 5,000 samples of Japanese, United States and German manufacture, and will include dyes, soaps, scents, pomades, glass bottles, and thermos flasks. Officers from the Department of Overseas Trade will be in attendance during the three days to assist British manufacturers and traders with regard to the exportation of their goods to overseas markets.

MESSRS. CLEMONS, MARSHALL & CARBERT, a branch of the Yorkshire Dyeworks & Chemical Co., Ltd., Leeds, are celebrating their Centenary. The business was started by Mr. John Marshall (grandfather of the present principal) in 1820 in a shed at Norwich, and the first dye to be manufactured was the Cudbear dye, which was made from the Orchella weed in the days before coal tar products. In 1840 the works were removed to Leeds. Thirty years later, on the death of the founder, the name was altered to Messrs. John Marshall, Son & Co. The firm became part of the Yorkshire Dyeworks Co., in 1900. Eighteen of the workpeople have an average

of 35 years' service with the firm: these include the director and manager. It is stated that they have not had a trade dispute during the whole of that period.

THE *Board of Trade Journal* states that samples and photographs of a Danish invention, together with a report for impregnating cement, may be seen at the Inquiry Office of the Department of Overseas Trade, 73, Basinghall Street, E.C.2. It is understood that the process is regarded as having established its claim to practical utility, and that besides the purchase of the rights by a well-known Danish company, the invention has already been taken up by a Norwegian company. Negotiations are also being carried on for the sale of the invention in Sweden, Holland, Germany, United States of America, the Argentine, and Mexico. The invention consists in the composition of a fluid in which the cement pipes are dipped, and it is claimed that the fluid thoroughly impregnates the pipes, which become thereby as serviceable for drainage and similar work as the glazed earthenware pipes generally used.

IN CONNECTION WITH the distribution of the supplies of dyestuffs which are becoming available from Germany under the Reparation Clauses of the Peace Treaty as well as for the purpose of advising on matters of general interest to colour consumers, the Colour Users' Association, with the approval of the Board of Trade, have appointed a small Advisory Sub-committee to confer with the Trade and Licensing Committee. The Advisory Sub-committee, the *Board of Trade Journal* states, consists of the following members: Mr. C. Rawson (chairman), Mr. J. W. Birtley, Mr. E. Bentz, Mr. J. R. Denison, Mr. J. M. Evans, Mr. G. E. Holden, Mr. W. W. C. Lishman, Mr. C. H. Walshaw, Mr. Ellis Green (secretary). Any consumer desirous of obtaining further information as to the activities of the Committee should communicate direct with the Secretary at Cromwell Buildings, Blackfriars Street, Manchester.

A CONGRESS to which the various manufacturers' and trade organisations of the country will be invited to send representatives is to be held in London early in February. The congress is being organised by the Federation of British Industries, and is intended to be a gathering on much the same lines as the annual Trades Union Congress. It will be representative of all the great industries, and will provide a public platform for the discussion of the outstanding questions of the day, such as nationalisation and transport, from the point of view of these industries. A presidential address will be delivered by Mr. W. Peter Rylands, the President of the Federation of British Industries. The object is to provide the organised industries of the country with an opportunity of laying before the public their views on questions the right solution of which is of paramount importance to the future of British industry.

PROFESSOR A. O. RANKINE last week at the annual exhibition, held by the Physical Society of London and the Optical Society, at the Imperial College of Science and Technology, gave a demonstration of telephony by means of light. The interesting point was brought out by the lecturer that the main effect of light upon the element selenium—which changes its electrical resistance according to the strength of light thrown upon it—is done by the red rays of the spectrum. A small amount of mist or fog between the transmitting and receiving apparatus made little difference, apparently on account of the ability of the stronger red rays to get through. The susceptibility of selenium to the red ray was illustrated by a magnified beam passed through red-coloured glass and thrown on to a scale by a mirror galvanometer. The maximum effect, Professor Rankine said, lay somewhere between the orange and the red.

THE ARRANGEMENTS for the British Industries Fair (Birmingham) to be held at Castle Bromwich Aerodrome, from February 23 to March 5, are rapidly approaching completion. The exhibitors number 650, and 100,000 sq. ft. of space has been taken. The Chamber of Commerce is providing hospitality and social amenities to overseas buyers; the Fair is under the joint organisation of the Chamber and the Birmingham Municipality and under the auspices of the Board of Trade. The chief features will be general hardware and engineering, the latter group being represented by 200 firms. In the display of engines, in operation, a great advance will be noted in the production of all classes of oil engines, particularly those in demand in India and the Near East. The Fair will strongly appeal to the metallurgist and chemical engineer. The advances made in industrial chemical research are particularly noticeable in the display of glass for electrical and other purposes. The section devoted to paints, colours and varnishes is well filled.

THE SHROPSHIRE MINES, LTD., in order to produce the best quality of ground barytes which science can devise and thus to keep the industry in England, are re-organising and restoring the lead mines industry in the country. Under the guidance of Colonel J. Ramsden Huglith Mine is being opened out rapidly, and it is hoped to make this a model mine. Borrington and Gatten old mines are also being opened out and promise well. Many improvements have been made at Hanwood Mills, and a completely new method of grinding is being inquired into. Improved lead milling and concentrating machinery are being installed. Two 400 H.P. engines have been installed to pump water out of the Bog Mine. In the Hoye Valley, since the Leigh level was driven through, cages have been erected at the Milne shaft. A drive has been started towards the Wood Mine, which it is hoped to reach by September. At Perkins Beach a light railway will be made to take the ore to the ropeway. The old Adit is being opened, and it is hoped soon to make this mine more productive and economical.

DR. C. H. DESCH, Sheffield University, last week, delivered the first of a series of lectures on "Our Principal Industries," in connection with the School of Social Study, at Glasgow University. Speaking of the iron and steel trade, Dr. Desch gave an account of the early establishment of ironworks in the Highlands of Scotland for the purpose of smelting the English ores with charcoal from the woods. This process, which lasted through the 17th and 18th centuries, was superseded by the smelting of clay band ores with coal, which began at Carron at the end of the 18th century, and was then extended to the West of Scotland. The Scottish steel industry was a late development, but had assumed enormous dimensions within recent years, although the industry was now dependent chiefly on imported ores. The fuel—the abundance of which led to the establishment of so many works in the West of Scotland—was now becoming relatively scarce, and the whole industry was undergoing great changes owing to the altered character of the raw materials.

THE BAUXITIC NATURE of certain carboniferous strata in Ayrshire is described in the Summary of Progress of the Geological Survey of Great Britain for 1918 (issued in 1919). A clay of Millstone Grit age has been found to be a good refractory, with 26 to 50 per cent. of alumina, 28 to 50 per cent. of silica, and combined water 7·5 to 15 per cent. Most of the alumina is combined with silica, probably as kaolin, but there remains an excess, as in bauxitic clays. This excess is, however, not easily soluble in hydrochloric acid, unlike that in bauxite. Oolitic varieties of the bed contain most free alumina. Basaltic lavas underlie the clay, and the conditions that produce laterite and bauxite seem to have prevailed in southern Scotland in Upper Carboniferous times. Search for this material will be made in other localities of carboniferous rock. It is pointed out that the quality of the material may vary considerably, and that the presence of titanium dioxide, which occurs as rutile, in a greater proportion than 5 per cent., reduces the refractory property considerably.

AT THE ANNUAL PUBLIC MEETING of the Paris Academy of Sciences, held on December 22, M. Léon Guiguard in the chair, the following prizes awarded in chemistry in 1919 were announced:—The Montyon prize (Unhealthy Trades) to Georges Rivat (2,500 francs), for his work on the analysis and absorption of asphyxiating gases; an honourable mention to Arnold Lassieur (1,500 francs), for his contribution to the identification of the substances contained in the German poison shells; an honourable mention (1,000 francs) to Cyrille Toussaint, for his chemical studies connected with the war; the Jecker prize between Ernest Fourneau (5,000 francs), for his services relating to the synthetical preparation of medicinal organic compounds, Louis Maillard(2,500 francs), for the whole of his work in organic chemistry, and Marcel Sommelet (2,500 francs), for his researches on the ether oxides, the homologues of benzyl chloride, alcohols and aldehydes; the Cahours foundation divided equally between Georges Mignonac and Marcel Murat, for their work in organic chemistry; the Houzeau prize to René Locquin, for similar researches.

FOR SOME TIME efforts have been made at Leeds University to make chemistry one of the foremost departments, and at present the department, which has been doubled in size, is overcrowded. An entirely new department has been opened for dyeing and colouring, and a degree course has now been instituted in colour chemistry and dyeing. Students going in for research in this direction first pass through a course of pure science, and then branch off into technical applications, and finally can graduate in dyeing for the B.Sc. The University has never had so many students for chemistry. A new laboratory has been erected and another is in preparation for next session. A great number of students are training specially as research chemists. The special laboratory set aside for British dyes is perhaps the busiest section of the chemistry department. Here research work is being carried on under Professor H. E. Perkin, the head of the department. There is a small band of chemists paid by British Dyes, Ltd., who are working in this research laboratory. The director of this department is Dr. Oeschman, who has a wide experience of colour works both at home and abroad.

SIR ROBERT HADFIELD, president of the Faraday Society, who presided at a symposium on "The Microscope: Its Design, Construction and Application," held on Tuesday at the rooms of the Royal Society, Burlington House, said that the objects of the symposium were improvement in the technique of the microscope, in lenses and in the application of the microscope to research in metallurgy. One of the aims which they ought to have in view was to obtain increased knowledge from examinations at higher magnifications. In the past there had been too much dependence on Germany and Austria for the supply of the best type of microscope. The situation ought to be remedied by private enterprise and research, and, if necessary, by research association, aided by the grants allocated by Parliament for such purposes. Had it not been for the enterprise of just one British firm with regard to the supply of optical glasses at the outbreak of the war we might have been absolutely stranded for necessary products.

American Notes

Production of Potassium Salts

The total production of refined potassium salts during 1918 amounted to 53,503,017 lbs., valued at $17,491,414; the sales amounted to 43,074,844 lbs., valued at $15,634,125, according to a report by the United States Geological Survey. In addition there were produced 62,972,000 lbs. of potassium chloride, more or less refined, and 13,652,000 lbs. of potassium sulphate.

Production of Selenium

The production of selenium in 1918 was 103,694 lbs., valued at $206,540, an increase of 162 per cent. in quantity and 195 per cent. in value as compared with figures for the previous year. Of the quantity sold during 1918 about 60 per cent. was used as a colouring and deoxidizing agent by the glass industry, according to the United States Geological Survey, Department of the Interior.

A New Caustic Soda Plant

A plant for the manufacture of caustic soda and liquid chloride is being constructed for the Monsanto Chemical Company on the east bank of the Mississippi, opposite the company's present buildings. In addition to the caustic soda and chloride building, the company has under construction a 2,000 horse power plant to generate electricity for the new venture. It will cost $300,000 and will have two 1,000 kilowatt reciprocating generators.

Perkin Medal Awarded to Dr. Chandler

The Perkin Medal for 1919, in recognition of "the most valuable work in applied chemistry" for the year, has been awarded to Dr. Charles F. Chandler of New York. In Dr. Chandler's case the award is not in respect of any one achievement but in recognition of his general work on behalf of chemical science and industry. Among the subjects to which Dr. Chandler has devoted himself may be mentioned his investigations into the flash point of Kerosene, which made possible the use of Kerosene for domestic lighting, sugar refining, the production of illuminating gas, and water supply. His invention of the Assay Ton Weight has been of great use to the mining and metallurgical industry, and his work in connection with the Castner process for making metallic sodium, cyanide, peroxide, &c., helped to establish a great electrochemical industry in the United States. He was also responsible for the laying of the foundation of the School of Mines and various engineering schools which have grown from it. In 1876 Dr. Chandler was chairman of the Chemical Section of the Centennial Exposition. He convened a meeting at that time of a few chemists out of which grew the American Chemical Society. He was one of the first presidents of the Society, and the originator of the Chemists' Club of New York. He has recently celebrated his 84th birthday.

Proposed Fixed Nitrogen Corporation

The United States War Department has drafted a measure, which has been introduced simultaneously in the Senate and in the House of Representatives, providing for the creation of the United States Fixed-Nitrogen Corporation. The stock in the corporation is to be owned exclusively by the Government. The Bill empowers the Secretary for War to designate any five persons to act as an organisation committee with authority to organise the corporation. Among other things the corporation is to have the power to make contracts, appoint a board of directors, other officers and employees, and to fix their salaries. It is to be conducted under the supervision of a board of directors consisting of not less than three nor more than 11 members, to be appointed by the Secretary for War. The corporation is to have the power to purchase, operate, and develop the nitrate fixation plants numbered 1 and 2, located respectively at Sheffield and Muscle Shoals, Alabama, together with the machinery, real estate, and laboratories pertaining thereto. This is to include the research laboratory at Washington, the Waco Limestone quarry in Alabama, and the Electric Power Unit at the Warrior River Station of the Alabama Power Company. After its completion the hydro-electric power plant now being constructed at Muscle Shoals is to be operated by the corporation. The corporation is also authorised to purchase, lease, or otherwise acquire United States or foreign patents and processes. It also may sell and export any of its surplus products not purchased by the United States or by persons within the United States.

Problems in the Cellulose Industry

The New York section of the American Chemical Society has been discussing the subject of "Present-day Problems in Regard to Cellulose." Mr. W. P. Cohoe contended that there was no foundation for the tradition that quick-growing plants do not make good paper. Bamboo and flax straw were excellent materials, and hemp and jute wastes were important for the purpose. Bagasse has not been profitable so far, but possibly the final word had not been said. The uses of paper and pulp were constantly increasing, and new sources must be found. Among new uses he cited the nitration of wood pulp and artificial silk as important consumers. In Germany a great deal of paper cloth had been used for bed ticking, but the future of paper textiles was not promising for human wearing materials. The art of the hydration of paper-making fibre had not yet been discovered. He confessed that they were still at sea in regard to the chemistry of cellulose. Professor R. H. McKee, of Columbia, remarked, in regard to paper materials, that they had not yet adequately addressed themselves to their proper culture. If chemists lead the way in encouraging foresters to develop fast-growing trees to meet present and future needs, the woods are likely to be forthcoming. Dr. Harold Hibbert made an earnest plea for a close study of the cellulose molecule, and stated that more particularly the American chemical journals had been less diligent in this respect than their British and German contemporaries. The difference between mono-molecular cellulose and sugar was one molecule of water, so that cellulose might be described as dehydrated sugar. Although the hydration of cellulose was not an accomplished fact, it certainly would be worth while to develop the process, and, in view of the immense importance and scope of the cellulose industry, a Government institute should be founded to work on cellulose.

Potash Recovery from Blast Furnace Gases

An interesting description of potash recovery processes as carried out in connection with English blast-furnace operations, together with notes on the work of the British Potash Production Bureau in relation to cement dust and other substances, is contributed by Dr. Harold Hibbert to the current number of *Chemical and Metallurgical Engineering*. The writer pays a tribute to the excellent work of the Potash Production Bureau, and more than one appreciative reference to the article on "The International Potash Situation," which appeared in THE CHEMICAL AGE of July 19, 1919. "According," Dr. Hibbert writes, "to an interesting article on this subject in THE CHEMICAL AGE, it is claimed that the post-war requirements for potash will be much greater than the pre-war requirements, and that, while the former cost of production of 80 per cent. potash is assumed to have been approximately £7 per ton, it cannot be expected that a lower price than about £15 to £25 per ton will be the rule for a considerable period of time. This estimate is based on the assumption that for many years to come the world's requirements of potash will be far greater than can be met by the combined output from the Alsatian and German fields. Attention is also drawn to the reported occurrence of rich potash deposits in the Italian colony of Erythrea, Abyssinia, some hundreds of tons of this material with a chloride of potash content of 75 to 95 per cent. having been exported during the war period. The extent and uniformity of these deposits, as well as of similar ones in Spain and Sicily, are still matters for investigation. Of possible interest is the reference in the same article to the extraction of potash from leucite by a new Italian process. Leucite is a double silicate of potash and alumina containing, when pure, about 28 per cent. K_2O; but the Italian product generally contains only 8 to 10 per cent. According to the new method, the gangue can be separated electromagnetically, thus increasing the K_2O content to 15 per cent."

Priestley's Home as a Chemical Memorial

The original home and laboratory of Dr. Joseph Priestley, the famous English chemist who discovered oxygen in 1774, which is located on the banks of the Susquehanna River at Northumberland, Pennsylvania, was purchased recently by chemist graduates of the Pennsylvania State College, who intend to preserve it as a lasting memorial to the great scientist. Upon learning that the Priestley homestead, which was built in 1794-96, was to be put up at public auction, the Penn State chemists sent as their representative to the sale Dr. G. G. Pond, dean of the School of Natural Science at the College, and he was successful in making the purchase. Architects from the College will at once make the necessary surveys preparatory to the work of moving the Priestley home from Northumberland, Pa., to the campus at State College, a distance of about 60 miles. When the purchase has been completed funds for the removal of the house and its re-erection on the College campus will be supplied by an unnamed donor. The reconstruction will be along the original architectural lines, but modernised and adapted to some suitable use by the School of Natural Science.

Dr. Priestley's work in the last half of the eighteenth contury established him as one of the greatest scientists in history. He is credited (says *Chemical and Metallorgical Engineering*) with the discovery of oxygen and many of its properties in his laboratory in England in 1774. About the same time he discovered ammonia and hydrochloric acid, and a year later he was credited with the discovery of sulphuric acid gas. Within another year he found nitrous oxide (laughing gas). His discovery of nitric oxide dates from 1772. A large amount of his experimental work was conducted after 1780 in Birmingham. He was a noted Dissenter in religious views and was persecuted in England for his Unitarian teachings and activity. His house in Birmingham was raided and all of his chemical and physical apparatus destroyed. He was made uncomfortable in London, and, not being sure of his life, he went to America in 1794. His sons had preceded him. He settled at once at Northumberland and built the Priestley mansion there. He continued his experiments there until his death in 1804. He was buried at Northumberland, and the house and grave have been visited by interested persons from all parts of the world. In 1874 a large number of chemists gathered there to celebrate the 100th anniversary of the discovery of oxygen. These chemists formed the nucleus of what is now the American Chemical Society.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

Locality of Firm or Agent.	Materials.	Ref. No.
Canada	Glass Bottles	—
Canada	Asbestos-Cement Products. (Canadian firm in position to supply)	—
Canada (Toronto)	Chemicals or Minerals consumed in Canada	62
(New Liskeard, Ontario)	Chemicals	60
(Vancouver) ...	Druggists' Sundries	65
Algeria (Algiers)...	Chemical Manures	86
Ecuador	Drugs	92
British India (Calcutta)	Chemicals	58

Messrs. Relph, Darwen & Pearce, paper, pulp and timber agents and importers, announce that they are open to buy large quantities of chemicals, namely sulphur, chloride of lime, caustic soda and salt cake, in cargoes of 1,000 tons or more, and will be pleased to hear from any subscribers to The Chemical Age.

Contracts Open

(6) Disinfectants, &c.—For the Camberwell Borough Council. Particulars from F. J. Slater, Borough Engineer, Town Hall, Camberwell, S.E.5. Tenders by February 2.

(25) Lime and Cement; (26) Oilman's Goods; (29) Carbolic Disinfectants.—For the Chelsea Borough Council. Particulars from Mr. T. W. E. Higgens, Borough Surveyor, Town Hall, Chelsea. Tenders by January 21.

(7) Pitch, Tar and Creosote Oil; (8) Tar Paving and Tar Macadam; (11) Oilman's Goods; (15) Disinfectants; (17) Oils.—Particulars from Mr. A. P. Johnson, Town Clerk, Town Hall, Haverstock Hill, N.W.3. Tenders by January 29.

Polish.—For the Commissioners of H.M. Works. Particulars from the Controller of Supplies, H.M. Office of Works, King Charles Street, Westminster, London, S.W.1. Tenders by January 19.

(c) Candles.—Particulars from Controller of Supplies, H.M. Office of Works, King Charles Street, Westminster, S.W.1. Tenders by January 22.

(4) Oils and Paints; (5) Portland Cement; (7) Tar Macadam; (8) Tar Paving Material.—For the Beddington and Wallington Urban District Council. Particulars from Mr. S. F. R. Carter, A.M.I.C.E., Engineer and Surveyor. Tenders by February 2.

Clearing Office for Enemy Debts

The Clearing Office for enemy debts provided for in the Treaty of Peace with Germany has now been established and Mr. Egerton Spenser Grey, Senior Official Receiver in Bankruptcy, has been appointed Controller. All communications should be addressed to: The Controller of the Clearing Office, Cornwall House, Stamford Street, S.E. 1. The following gentlemen, who have consented to serve in an honorary capacity, will act as a Committee to advise the Controller in the operation of the Clearing Office: Sir William Plender, C.B.E. (Chairman), Mr. George Watson, Mr. O. R. A. Simpkin, C.B.E. (Public Trustee), Mr. H. A. Payne, C.B. (Board of Trade). Particular branches of industry and commerce are being invited to nominate representatives to confer with the Controller on technical questions. Notices giving instructions as to the steps to be taken for proving their claims have been sent to creditors in the United Kingdom who have registered with the Public Trustee as Custodian claims against German nationals. Notices requesting payment of their debts to the Controller have also been sent to debtors in the United Kingdom who have registered with the Public Trustee as Custodian debts owing to German nationals. Any creditor or debtor who does not receive a notice should communicate with the Controller of Clearing the Office.

Kitchener Scholarships

Twenty-one Awards to Students in Chemistry

Of the 86 Scholarships granted by the Lord Kitchener National Memorial Fund to the sons of officers, n.c.o.'s and men of H.M. Forces, the following 21 have been awarded to students of chemistry, chemical technology and industrial chemistry:—

Chemistry.

Child, R., Portsmouth Grammar School, £150 per annum and fees for three years at King's College, London.

Chemical Technology.

Ashford, B. O., Haberdashers' School, £90 per annum and fees for 1⅔ years at East London College.

Forsyth, W. G., Central High School, Manchester, £60 per annum and fees for three years at Manchester College of Technology.

Industrial Chemistry.

Cowan, R., Salford Municipal Secondary School, £90 per annum and fees for three years at Manchester University.

Dawson, E. R., Hull Grammar School, £150 per annum and fees for three years at Leeds University.

Drake, W. S., Scarborough Municipal Secondary School, £150 per annum and fees for three years at Leeds University.

Flint, J. H., King Edward's Grammar School, £125 per annum and fees for three years at Birmingham University.

Hall, A. W., Reading School, £125 per annum and fees for three years at Imperial College of Science.

Kelly, C. I., Carnarvon Intermediate School, £130 per annum and fees for three years at Manchester College of Technology.

Liddell, H. F., Oxford High School, £150 per annum and fees for three years at Imperial College of Science.

Madden, F. C., Rutlish School, Merton, for three years at Imperial College of Science.

Marrison, L. W., Battersea Grammar School, £125 per annum and fees for three years at East London College.

Mitchell, A. E. P., West Ham Central School, £125 per annum and fees for three years at East London College.

Morrison, J. O., Portsmouth Secondary School, £150 per annum and fees for three years at Imperial College of Science.

Palmer, A. D., Battersea Polytechnic Secondary School, £125 per annum and fees for three years at University College.

Rawson, A. E., Yardley Secondary School, Birmingham, £125 per annum and fees for three years at Birmingham University.

Slaughter, B. I., Sherborne, £60 per annum and fees for 2⅔ years at Imperial College of Science.

Small, G. G., Boroughmen's School, £75 per annum for four years at Edinburgh University.

Taylor, H. W. B., County High School, Ilford, £125 per annum and fees for three years at King's College, London.

Temperley, D. R. T., Manchester Grammar School, £120 per annum and fees for 2⅔ years at Manchester University.

Vineall, G. J. C., King Edward's Grammar School, Southampton, £125 per annum and fees for 2⅔ years at University College, Southampton.

Enterprise in Germany

Germany is getting seriously to work again in connection with the restoration of her industrial position.

The Metallbank, at Frankfort, proposes to raise its share capital from 50,000,000 marks to 75,000,000 marks by issuing new shares at 40 per cent., participating in the pending April dividend. It has been decided that the takings of the Metallbank and those of the Metallurgische Gesellschaft, which are both under the same control, shall be pooled and the profits shared pro rata.

The Hirsch Kupfer und Messingwerke also proposes to increase its capital to 50,000,000 m., this step being considered necessary owing to the extraordinary rise in all raw materials and the intensified working of the concern. The new shares are to be issued at 115 per cent. by a syndicate headed by the Deutsche Bank. The last increases of capital of the Hirsch concern took place in 1916 by 6,000,000 m., and in 1918 by 15,000,000 m.

Recent Wills

Mr. J. R. Bottomley, of Chelmsford Road, Bradford, late of Messrs. John Shaw & Co., a branch of the Bradford Dyers' Association £2,594

Mr. H. J. Jopp, Aberdeen, a director of the Oban and Aultmere-Glenlivet Distilleries, Ltd. £107,270

Mr. James Elstub, of Parkfield Road, Eccleshill, Bradford, wool merchant and wool scourer and carboniser, of Messrs. Sucksmith & Co., of Bradford, and of The Valley Scouring Co., Shipley..... £39,880

Mr. D. Richards, of Ardwyn, chairman of the Northern Mines, Ltd., the Taquah Central Mines, Ltd., the Maikop Deep Drilling Co., Ltd., and a director of several other companies £59,304

Sir Peter Wyatt Squire, Ph.C., F.C.S., of Shepperton, and of Squire & Sons, Ltd., Oxford Street, W., for half a century chemists and druggists to the Royal Family £17,388

References to Current Literature

Only articles of general as distinct from specialised interest are included and given in alphabetical order under each geographical subdivision. By publishing this digest within two or three days of publication or receipt we hope to save our readers time and trouble; in return we invite their suggestions and criticisms. The original journals may be consulted at the Patent Office or Chemical Society's libraries. A list of journals and standard abbreviations used appeared in our issue of December 27 last.

British

ARSENIC. New process for the estimation of arsenic, with notes on the chemistry of the Marsh-Berzelius process. B. S. Evans. *Analyst*, January, 8-17.

COAL. Coal economy: Suggestions for reduction of coal in breweries. W. B. Briggs. *J. Inst. Brewing*, January, 24-41.

A study of the forms in which sulphur exists in coal. A. R. Powell and S. W. Parr. *Gas J.*, January 13, 79.

ELECTRICITY. Electricity supply and the economical use of coal. W. B. Woodhouse. *J. Text. Inst.*, January, 3-6.

GAS. Some mechanical aspects of purifier installations. F. R. Parsons. *Gas World*, January 10, 25-26.

INVENTION. The capitalist and the inventor. *Engineering*, January 9, 39-40. Notes on some of the difficulties under which inventors labour.

MOTOR FUELS. Report on benzole road tests, 1919. Automobile Assoc. and Motor Union, 39 pp. A detailed report of the trials carried out last year. (*See* CHEMICAL AGE, 1920, 3.)

Producer gas for motor vehicles. D. J. Smith. *Gas World*, January 10, 30; also *Engineering*, January 9, 59-64. A Paper read before the Institution of Automobile Engineers on January 8.

ORGANISATION. The State in relation to industry. A Steel-Maitland. *J. Text. Inst.*, January, 6-10. A discussion of questions of State control and management.

PATENTS. The new Patents Act. *Engineering*, January 9, 53-54. A short explanation of the clauses of the new Act and their effects.

Colonial

SOUTH AFRICA. Inorganic chemical industries. M. Rindl. *S. Afr. J. Ind.*, November, 1043-1052. Notes on the uses, occurrence and production of gypsum and plaster-of-paris, potassium nitrate and other potassium salts, and carbon dioxide.

French

ACROLEIN. Stabilisation of acrolein, IV. C. Mouren, C. Dufraisse, P. Robin, and J. Pougnet. *Comptes rend.*, January 5, 26-31. The stabilising action of phenolic compounds has been investigated.

ALCOHOL. Industrial process for the synthetic manufacture of alcohol and ether from coal distillation gases. E. de Loisy. *Comptes rend.*, January 5, 50-53. The fixation of the ethylene in coal gas by means of sulphuric acid is discussed.

ALUMINIUM. Aluminium which oxidises spontaneously in air. E. Kohn-Abrest. *Comptes rend.*, December 29, 1393-1395. A spontaneously oxidisable metal has been isolated from condensed aluminium vapour.

ANALYSIS. Determination of nitrogen by means of the nitrometer in celluloid and explosives. P. Nicolardot and H. Vourloud. *Chim. et Ind.*, November-December, 1317-1320.

BENZENE. Estimation of thiophen in commercial benzenes. A. Meyer. *Comptes rend.*, December 29, 1402-1404.

COMBUSTION. Production of carbon monoxide in flames formed by different gases. A. Kling and D. Florentin. *Comptes rend.*, December 29, 1404-1406. An investigation of the proportions of carbon monoxide formed when various gases are burnt in ordinary domestic heating and lighting apparatus.

FUEL. Economical utilisation of fuel. A. Joulot. *Techn. Moderne*, December, 522-526. The author regards low-temperature carbonisation as the most economical process of the future.

NITROGEN OXIDES. The dissociation constant of nitrogen peroxide. E. Wourtzel. *Comptes rend.*, December 29, 1397-1400.

PLANT. Acid-resisting metals. C. Matignon. *Chim. et Ind.*, November-December, 1283-1302. An account of the manufacture, properties, and uses of ferrosilicons and iron rich in silicon.

New apparatus for absorbing large quantities of gases. I. Moscichi. *Chim. et Ind.*, November-December, 1303-1316. Laboratory and works apparatus is described which has been used successfully for absorbing nitrous gases.

SEWAGE. The bacterial flora of sewage purified by the activated sludge process. P. Courmont and A. Rochaix. *Comptes rend.*, January 5, 75-78.

TIN. Determination of arsenic in tin and tin plating. L. Vallery. *Comptes rend.*, December 29, 1400-1402.

TUNGSTEN. The development of the tungsten industry. G. Michel. *Techn. Moderne*, December, 527-531. The uses, production and consumption of tungsten are described.

United States

ANTIMONY. Treating antimony ores. G. P. Hulst. *Chem. & Met. Eng.*, December 10-17, 727. The practice of the International Lead Refining Co. is described.

CONCRETE. Effect of vibration, jigging and pressure on fresh concrete. D. A. Abrams. *Bull. 3, Structural Materials Res. Lab., Lewis Inst., Chicago*, 23 pp.

COPPER ALLOYS. Experience with a 91 : 9 copper-aluminium alloy. A. J. Krynitzky. *Chem. & Met. Eng.*, December 24-31, 770-771. Experiences in Russia on the physical properties of this alloy are described.

GAS ANALYSIS. An improved Orsat apparatus for gas analysis. G. W. Jones and F. R. Neumeister *Chem. & Met. Eng.*, December 10-17, 734-736. The apparatus here detailed has been developed by the U.S. Bureau of Mines.

INDUSTRY. Chemistry and the South. A. D. Little. *Chem. & Met. Eng.*, December 10-17, 710-714. Presidential address to the American Institute of Chemical Engineers, dealing with the prospects of chemical industry in the Southern United States.

IRON. Phosphatic coatings for rust-proofing iron and steel. L. E. Eckelmann. *Chem. & Met. Eng.*, December 24-31, 787-789. An account of the production of rust-proof coatings by means of phosphoric acid, &c.

MINERAL OILS. Need of extended research in the petroleum industry. V. H. Manning. *Chem. & Met. Eng.*, December 10-17, 727-728.

Tentative regulations for storage and use of fuel oil. *Chem. & Met. Eng.*, December 24-31, 781-785. A report of the Committee on Inflammable Liquids of the National Fire Prevention Association, New York.

POTASH. Potash recovery from blast-furnace gases in England. H. Hibbert. *Chem. & Met. Eng.*, December 10-17, 723-726. An account of progress in England in this direction, and also in the treatment of cement kiln gases.

Potash deposits in Spain. H. S. Gale. *Eng. & Min. J.*, November 8-15, 758-763. An illustrated description of the "Salina de Cardona."

ORES. Use of naphthylamine and xylidine in flotation. E. H. Robie. *Eng. & Min. J.*, November 1, 730-732. The improved results obtained by using these substances in place of oil are described.

PLANT. Resistance of absorption tower packing to gas flow. F. C. Zeisberg. *Chem. & Met. Eng.*, December 24-31, 765-767. A useful Paper read before the American Institute of Chemical Engineers.

SHELLAC. Pure gum shellac. C. H. Jones. *Chem. & Met. Eng.*, December 10-17, 715-721. An interesting account of the origin, manufacture and analysis of shellac, and specifications for varnishes.

TOLUOL. The production of toluol from gas plants. M. S. Falk. *Proc. Amer. Soc. Civ. Eng.*, October-December, 775-793. The work carried out in America is described and the legislation on the subject discussed.

WOOD. The Forest Products Laboratory. C. H. Jones. *Chem. & Met. Eng.*, December 24-31, 757-764. An illustrated account of the Laboratory and its work.

German

GAS. Non-residual gasification. H. Strache. *J. Gasbeleucht.* November 29, 709-713. A lecture delivered at the celebration of the 70th birthday of H. Bunte.

FOODS. Chemistry of foods and foodstuffs in 1917-1918. F. H. Kuttenkeuler. *Chem. Zeit.*, December 11 and 18, 869-870, 889-890 (Continuation, *see* CHEMICAL AGE, 1920, 20).

INORGANIC COMPOUNDS. Progress of the inorganic heavy chemical industry during the war. *Chem. Zeit.*, December 16 and 18, 881-883, 890-891. The literature of peroxides and persalts and of the inorganic compounds of carbon is reviewed. (*See also* CHEMICAL AGE, 1919, 645, 696, 775; 1920, 20).

LEAD. Use of lead as a substitute for platinum. C. Hütter. *Z. angew. Chem.*, December 16, 380. The use of lead crucibles in analysis is discussed.

LUBRICATION. Technical and economic aspects of lubrication. F. Frank. *Z. angew Chem.*, December 9 and 16, 374-376, 377-379. An interesting and useful Paper.

METALLURGY. Working up of complex ores and furnace products. W. Hommel. *Metall. u. Erz.*, December 8, 559-576. A number of new processes are described (*see also* CHEMICAL AGE, 1919, 725).

TUNGSTEN. Estimation of tungsten in ferro-tungsten. L. Löwy *Z. angew. Chem.*, December 16, 379-380.

Patent Literature

We publish each week a list of selected complete specifications accepted as and when they are actually printed and on sale. In addition, we give abstracts within a week of the specifications being obtainable. Readers can thus decide what specifications are of sufficient interest to warrant purchase, the only way of obtaining complete information. A list of International Convention specifications open to inspection before acceptance is added, and abstracts are given as soon as possible.

Abstracts of Complete Specifications

105,769. DESOXYCHOLIC ACID, PROCESS FOR THE MANUFACTURE OF PRODUCTS OF ADDITION OF. H. Wieland, 18, Romanstrasse, Munich, Germany. International Convention date (Germany), February 10, 1916.

Three gall acids, cholic acid, choleic acid and desoxycholic acid, may be separated from gall boiled with caustic alkalis. It is now found that various choleic acids may be produced from desoxycholic acid by treating it with various organic compounds other than ether, acetic acid, alcohol, and petroleum ether, either in solution or in the molten state. Examples are given in which stearic acid, naphthalene, phenol and benzaldehyde are employed to form addition compounds. The products are intended for pharmaceutical purposes.

135,931. GAS, METHODS OF AND APPARATUS FOR PURIFYING —AND OBTAINING VALUABLE BY-PRODUCTS THEREFROM. F. A. Umsted, 4,155 Sheridan Road, Chicago. Application date, December 3, 1918.

The gas is treated in a continuous flow apparatus consisting of a number of adjacent chambers, to two distinct series of processes. In the first series the heavy constituents are removed by fractional cooling out of contact with the cooling fluid, and the gas is then subjected to the action of various materials by direct contact, according to the ingredients to be removed. The absorbing materials may comprise water-removing substances, dry iron oxide and sawdust, lime and charcoal, and lime and coke. Ammonia, sulphur, cyanogen, naphthalene, heavy benzol, &c., are thus obtained. The process and apparatus are described in detail.

135,959. GAS PRODUCING PLANT. W. Climie, 114, New Road, Ayr, and W. Lees, 35, McAlpine Street, Glasgow. Application date, December 9, 1918.

Steam is produced in a generator by means of a gas producer within it, and supplies an engine which operates the fuel-elevating machinery, the blowing apparatus for supplying air to the producer, the fuel rake, the chain grate, and the pump for supplying pressure water to the top of a purifier. The producer gas passes through a cooler and a purifier.

125,578. ALUMINA POOR IN IRON, PROCESS FOR PRODUCING. Det Norske Aktieselskab for Elektrokemisk Industri Norsk Industri-Hypotekbank, 1, Bygdö Allé, Christiania. International Convention date (Norway), April 8, 1918.

Labradorite or similar mineral rich in plagioclase is dissolved in nitric acid on the counter-current principle, till a neutral solution of nitrates is produced. The residue is filtered off and alumina is gradually added to the solution which is kept at about 40°C. to precipitate the iron and silica. The precipitate is filtered off, the solution evaporated, and the residue heated to about 300°C., which decomposes the aluminium nitrate only. The mass is then lixiviated with water to dissolve the calcium and other nitrates, and pure alumina suitable for the manufacture of aluminium remains. The solution may be separated, evaporated, and used as a fertiliser. The necessary heat for evaporating the nitrate solution after the removal of the silica and iron, and for heating the residue to 300°C., may be obtained by using the hot gases from a nitric acid plant for the oxidation of atmospheric nitrogen.

135,815, 135,819, 135,820. ELECTRO-OSMOTIC APPARATUS FOR REMOVING LIQUIDS FROM SUBSTANCES. Elektro-Osmose Aktiengesellschaft (Graf Schwerin Gesellschaft), Lindenstrasse 35, Berlin, S.W.68, Germany. International Convention date (Germany), October 20, 1917.

135,815. In an electro-osmotic apparatus of the filter press type, in which the liquid is separated at a cathode of pervious material, the liquid is fed into the cell formed by the cathode and anode plates at a point adjacent to the cathode. The raw material thus flows along the cathode and a more uniform action is obtained.

135,819. In electro-osomtic apparatus of the above type, the anode plates are hollowed out on both sides, so that when separated by the cathode plates, chambers for the liquid are formed. The cathode may be formed of two parallel perforated metal sheets enclosing a chamber into which the separated liquid passes, and from which it is discharged.

135,820. To obtain a more uniform cake of deposited material on the electrode surface, the material is introduced through openings arranged centrally, or uniformly distributed over the flat surface of the separating chamber.

136,187. CAFFEINE WITH ALKALI SALTS OF ACETYL-SALICYLIC ACID, PROCESS FOR PREPARING DOUBLE COMPOUNDS OF. H. Sefton-Jones, London. (From The Chemische Fabrik Johann A. Wülfing, Friedrichstrasse, Berlin, Germany.) Application date, January 8, 1918.

Equivalent weights of acetyl-salicylic acid, an alkali carbonate, *e.g.*, lithium carbonate, and caffeine are mixed in the dry state, and then moistened with alcohols, esters, ketones, or chlorinated hydro-carbons of the aliphatic series to a thick paste. The paste is kneaded until a sample is soluble in water without residue and without liberation of carbon dioxide, and the solvent is then removed by evaporation in a vacuum at a temperature below 30°C. Alternatively, lithium-acetyl-salicylate and caffeine may be used as the starting materials for the production of the double compound.

136,190. AMMONIUM NITRATE, PRODUCTION OF. J. R. Partington, G. J. Jones and T. K. Brownson, all of The Munitions Inventions Research Laboratory, University College, Gower Street, London, W.C.1. Application date, March 4, 1918.

The process is for the direct production of solid ammonium nitrate from oxides of nitrogen, oxygen, water and ammonia. Gases containing about 10 per cent. by volume of oxides of nitrogen, produced for example by the oxidation of ammonia, are mixed with air, oxygenised air, or oxygen, containing an amount of oxygen equivalent to three to four times that theoretically required to convert the whole of the oxides of nitrogen into nitrogen dioxide. The proportion of water vapour is reduced by cooling, to a maximum amount which is sufficient to convert the whole of the ammonia added into ammonium nitrate. The mixture of oxides of nitrogen and oxygen is passed through a chamber of sufficient volume to allow time for the reaction, and the mixture of ammonia and air or oxygen is introduced into this chamber at high velocity. Preferably the amount of ammonia in the mixture should be about one-third of that theoretically necessary to react with all the oxides of nitrogen, and the mixture should be introduced into the centre of the reaction chamber. Solid ammonium nitrate is deposited, and the residual gas containing oxides of nitrogen is treated with a further quantity of ammonia. Under the above conditions solid ammonium nitrate of satisfactory purity can be obtained.

136,255. ORES, CONCENTRATION OF. S. Tucker, and Minerals Separation Ltd., 62, London Wall, London, E.C.2; and E. Edser, 3, Hillyfields Crescent, Brockley, London, S.E.4. Application date, December 10, 1918.

A mineral-frothing agent for use in the froth-flotation process for concentrating ores may consist of the following:— A mixture of a soap solution, *e.g.*, sodium oleate, and an alkaline sulphide or sulphydrate; a fatty acid and an alkaline sulphide; an alkaline hydrate or carbonate treated with sulphur and mixed with a fatty acid; an alkaline sulphide mixed with sulphur and a fatty acid; a soluble soap and an aqueous solution of sulphuretted hydrogen. Examples of the treatment of ores containing lead, zinc, tungsten, tin, &c. are given.

136,298. PHENOL FORMALDEHYDE CONDENSATION PRODUCTS. F. J. Robinson, Bridge Works, Cowley, Middlesex, and Damard Lacquer Company, Ltd., 82, Victoria Street, London, S.W.1. Application date, December 20, 1918.

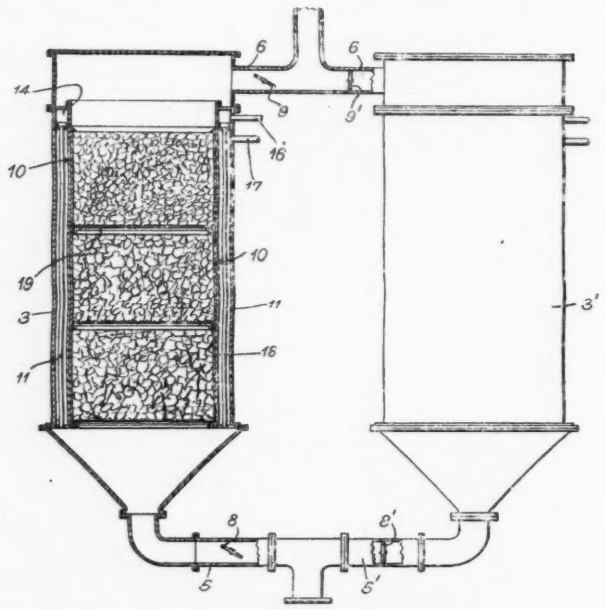
An insoluble product which is flexible when hot, is made from phenol or its homologues 750 parts, formaldehyde 40 per cent. solution 675 parts, ammonia (sp. gr. 0·88) 90 parts, and castor, camphor, linseed, rape, cottonseed or other oil 50-80 parts. The details of manufacture are given.

136,309. CONTINUOUS VACUUM FILTERS. A. E. Alexander, London. (From United Filters Corporation, 36, Flatbush Avenue Extension, Brooklyn, New York.) Application date, December 30, 1918.

The filter consists of a series of vertical discs mounted on a horizontal shaft, each disc being divided radially into sectors which are separately connected to corresponding longitudinal pipes within the central shaft. The discs rotate in the medium to be filtered which is contained in a tank enclosing the lower halves of the discs. One side of the tank is of ordinary form, but the other side consists of a number of flat projecting portions, each enclosing the corresponding portion of one of the filter discs. Each sector of a disc consists of a wire body enclosed by a filter bag, and a partial vacuum is maintained in the bags as they pass through the liquid to be filtered. The deposited filter cake is sprayed with water during its passage outside the tank, and on approaching the projecting portions of the tank again, the filter bags are inflated, and the cake removed by scrapers. The construction of the apparatus is described in detail.

136,342. AMMONIA, PURIFICATION OF. C. L. Parsons, United States Bureau of Mines, Washington, D.C., and L. C. Jones, Solvay Process Company, Syracuse, N.Y., U.S.A. Application date, January 20, 1919.

Ammonia which is prepared from cyanamide frequently contains phosphine, and when the ammonia is oxidised catalytically to nitric acid the presence of phosphine is deterimental to the platinum or other catalyst. The invention relates to the removal of the phosphine. Two chambers, 3 and 3^1,



136,342

are each provided with an inner cylinder 10 having transverse metal screens 19 supporting the catalyst, which consists of charcoal. The annular space between the cylinders is provided with longitudinal tubes 11, opening at the top into an annular header 14, and at the bottom into a conical space connected with the pipe 5. It is found that at a temperature of 50°-60°C., the phosphine in the ammonia-air mixture is oxidised by the aid of the catalyst, but the ammonia is not. The ammonia-air mixture passes through the valve 8, pipe 5, cylinder 10, pipe 6, and valve 9, to the oxidiser. Ammonia is rapidly absorbed by the charcoal until equilibrium is reached, the phosphine is oxidised to phosphoric acid, and this combines with ammonia forming ammonium phosphate which is deposited in the charcoal. When the charcoal becomes clogged, the gas is diverted through a similar chamber 3^1 by operating valves 8, 8^1, 9, 9^1, and steam is admitted through the pipe 17 to the annular chamber, while air is blown through the pipe 16 and tubes 11, and then passes upwards through the charcoal. The hot air extracts the absorbed ammonia and conveys it to the oxidiser. The cylinder 18 may then be extracted bodily, and the charcoal revivified by washing. The catalytic properties of the charcoal may be improved by inpregnating it with metals of the silver group.

136,356. GAS FURNACES. South Metropolitan Gas Company, and D. Chandler, 709, Old Kent Road, London, S.E.15. Application date, January 28, 1919.

Gas and air are injected tangentially into the combustion chamber from the burner nozzle, but part of the air necessary for combustion is admitted tangentially in front of the burner nozzle at the point at which the flame would otherwise impinge on the furnace wall. Intense local heating is thus avoided.

136,450. CRUDE BENZOLS AND THE LIKE, PROCESS AND APPARATUS FOR THE CONTINUOUS DISTILLATION AND FRACTIONATION OF. E. C. R. Marks, London. (From Société Franco-Belge de Fours á Coke, 100 and 101 Avenue de la Toison d'Or, Brussels, Belgium.) Application date, May 1, 1919.

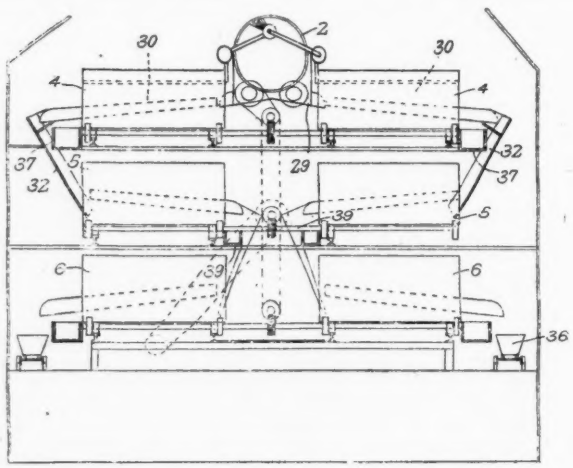
Crude benzol from coke ovens or gas works is admitted continuously at the top of a distilling column and steam is admitted continuously at the bottom in counter-current. Mixtures of vapour and steam are drawn off at different levels in the column and at the top, and are conveyed to separate condensers and the condensed water removed. The distilling column may be replaced by a number of separate columns in series, the vapour being extracted at the top of each column.

136,452. LIQUID FUEL. E. C. R. Marks, London. (From U.S. Industrial Alcohol Company, 27, William Street, New York.) Application date, May 5, 1919.

The fuel may be composed of gasolene 25 parts, kerosene 25 parts, alcohol 25 parts, and acids obtained by saponifying linseed oil 13 parts. The acids may compromise linolic, linolenic, and oleic, and rape oil may be used instead of linseed oil.

136,459. MINERAL DREDGING, CONCENTRATION PLANT PARTICULARLY ADAPTED TO THE REQUIREMENTS OF. W. W. Richardson, 4, London Wall Buildings, London, E.C.2. Application date, May 17, 1919.

Alluvial gravel raised by dredges is delivered to the central perforated rotating trommel 2, and the coarser material is



136,459

separated and discharged to a chute at the other end. The finer material passes through the perforations to the channels 29, and thence to the transverse rotating trommels 4, where the mineral values and a portion of the gravel are washed off into the trays 30, and thence to the chutes 32 and second series of trommels 5. The material is treated similarly in the trommels 5 and 6 successively, and the clean mineral concentrate is finally delivered into the trucks 36. The debris from the trommels 5 and 6 is conveyed away by the launders 37 and 39 respectively.

136,489. ETHYLENE DICHLORIDE, PROCESS OF PREPARING. E. C. R. Marks, London. (From Union Carbide Company, 42nd Street Building, New York.) Application date, July 2, 1919.

Ethylene dichloride is prepared by passing ethylene in liquid or gaseous form through liquid chlorine. The ethylene supply is maintained at a pressure above that of the chlorine vapour in the reaction vessel at the temperature employed.

International Specifications Not Yet Accepted

134,815. FATTY EMULSIONS, COOLING AND CRYSTALLIZING. K. Erslev, 268, Groesbeekscheweg, Nijmegen, Holland. International Convention date, November 7, 1918.

Fatty emulsion is fed on to the upper surface of a horizontal rapidly rotating disc in an exhausted vessel. The emulsion is thereby cooled and crystallized, and deposited at the bottom of the vessel, from which it is finally removed by a worm conveyor.

LATEST NOTIFICATIONS.

137,284. Gases, Method of Separating—and Apparatus therefor. W. A. Patrick, B. F. Lovelace and E. B. Miller. December 28, 1918.

137,288. Lead, Method of Converting Metallic into its Oxides. J. A. Thibault. December 30, 1918.

137,291-2-3. Rosin-like Substances, Process for the Manufacture of. M. Melamid. December 27, 28 and 2 , 1918.

137,296. Potassium Sulphate. Manufacture of. Fabriques de Produits Chimiques de Thann et de Mulhouse. December 28, 1918.

137,300. Fractionating Apparatus. Rosanoff Process Co. December 23, 1918.

137,323. Tanning Substances, Manufacture of Artificial. M. Melamid. December 24, 1918.

137,328. Ethyl Chloride Tubes. A. Schraders Son, Inc. January 2, 1919.

Specifications Accepted, with Date of Application

136,577. Tungstates from the gangue resulting from the decomposition of the ore, Method of and means for the separation of fusible. C. J. Head. June 27, 1917.

136,585. Carbonaceous material, Apparatus for the distillation of solid. C. D. Burney. August 31, 1918.

136,588. Gas-fired shaft kilns for burning or roasting non-sintering substances. A. Steiger and W. Steiger. October 14, 1918.

136,651. Evaporating or concentrating liquids, Apparatus for. E. Shaw. December 19, 1918.

136,690. Liquid oxygen, Jacketed containers for. L. S. Hinks. January 24, 1919.

136,716. Caoutchouc or caoutchouc-like substances, Process for accelerating the vulcanisation of. S. J. Peachey. February 21, 1919.

136,718. Potassium compounds, Apparatus for recovering. H. Fairbrother (*Chemical Construction Company.*). February 24, 1919.

136,750. Cyanides, Method of manufacture. W. J. Mellersh-Jackson. (*Air Reduction Company Inc.*). April 23, 1919.

136,758. Mixing, circulating, and agitating materials in a liquid or semi-liquid state, Apparatus for. W. J. C. Coles and E. Allen & Co. May 19, 1919.

136,768. Radium, Production of compounds of. H. O. Hedstrom. June 6, 1919.

136,772. Cyanides, Production of. C. T. Thorssell and H. L. R. Lunden. June 20, 1919.

136,790. Fuel. J. V. Eyre. September 12, 1919.

A GENERAL PROCESS for reducing tungstic acid into tungsten powder, and molybdenum sulphide into metallic molybdenum, has been worked out by a Norwegian firm, A/S Norsk Staal (Elekriskt-Gas-Reduktion), Dronningensgt, 22, Christiania, Norway. The firm state that the cost of this process for converting the ores into metal is lower than any other method known to them, and they claim that the fina products, which are in the form of small tablets, are completely free from sulphur, carbon, or oxygen.

The Indian Market

(FROM OUR OWN CORRESPONDENT)

Price of Artificial Fertilisers

The current prices of artificial fertilisers per ton, compared with those ruling before the war, are as follows :—

	Pre-war prices.		Present prices.
Superphosphate	Rs.95	.....	Rs.280
Sulphate of potash	Rs.175	.....	Rs.440
Sulphate of ammonia	Rs.267	.....	Rs.540
Nitrate of soda	Rs.210	.....	Rs.500

The Madras Agricultural Department is interested in phosphates and malt. Almost all crops in Southern India need phosphoric acid. In the Trichinopoly phosphate deposits an enormous potential store exists, and research is being carried out with a view to ascertaining how these deposits can be used along bacterial and chemical lines.

Patents, Trade Marks and Designs

The charge for the registration of designs is about Rs.75.

With regard to trade marks, there is no registration under a Trade Mark Act, as in England. Particulars of trade marks may be registered in the Government Registry, and this registration constitutes evidence of ownership of the trade mark. Agents charge about Rs.30, including Government fee.

Regulations regarding patents and registration of trade marks and designs in India are of interest. In the first place, patent agents vary their fees according to the amount of work done. The cost of an application and specification in British India, including Government fees for four years' protection, is about Rs.150, whilst an extra charge is made for drawings. A patent is granted for 14 years, the additional Government fee from the fifth to ninth year being Rs. 50 yearly, and from the 10th to 14th year Rs.100 yearly. A British Indian patent does not cover the Native States, Central India, Rajputana, Mysore and Travancore.

Commercial Development

A British Chamber of Commerce has been formed in Bagdad for the protection and development of trade with other parts of the British Empire.

It has been proposed that in official statistics the quantity of vegetable, animal and essential oils should be expressed in weight of cwts. and lbs., instead of, as at present, in gallons.

The balance of trade in favour of India for the first seven months of the official year, April–October, 1919, is Rs.492,200,000, as against Rs.206,400,000 during the same period in 1918.

During 1918-19 the Bombay Salt Department produced 16,600,000 maunds. The output of magnesium chloride from the bitterns of the Kharaghoda Salt Works was 39,000 cwts. The introduction of improved methods of producing this and other by-products is receiving much attention at the present time.

From available figures it will be seen that Indian imports have shown a tendency to increase. For the first seven months of the official year, April–October, 1919, the value of imports into India were Rs.1,044,273,586, as against Rs.982,809,284 during the same period of 1918. Of these, the values were: Gums and resins, Rs.2,195,672, oils Rs.53,813,395, chemicals Rs.21,801,019, instruments, &c., Rs.41,310,035, dyes and colours Rs. 17,626,899, machinery Rs.57,920,775, paper Rs.17,561,216, miscellaneous articles Rs.63,847,066, &c.

Enemy Aliens in India

For the present, the admission of former enemy aliens to India will be regulated by passports, and legislation to give effect to this decision is to be introduced.

At the conference of Chambers of Commerce held in Calcutta on January 8th, under the presidency of his Excellency the Viceroy, the status of aliens in India and Burma with reference to trade, residence and ownership of property, and the introduction of an Anti-Adulteration Act for India and Burma were discussed.

In regard to British born women married to former enemy aliens, the prohibition will be relaxed. Following the practice in the United Kingdom, unconditional leave to enter India will be given to such British-born women, whether their marriage be terminated by death or divorce, or whether their husbands be alive, and they will be allowed to bring with them foreign-born daughters of any age who are unmarried and living with them, and foreign-born sons under 16 years of age.

The enemy alien question is claiming a good deal of interest, and it has been suggested by the Government that Germans shall be prevented from entering India for three or five years after the conclusion of the war, the matter to come up for further consideration on the expiration of that period. Exceptions will only be made when very special reasons to justify admission into the country can be established. Such exceptions might be claimed on the grounds that an individual served with the British or Allied Forces during the war, that he was by birth a British subject, or that he was a native of territory which ceased to be German as a result of the Peace Treaty. The same general prohibition will apply to former enemy aliens other than German or Asiatic subjects of Turkey.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, JANUARY 14, 1920.

The last week has been one of continued activity in the chemical trade, but business has been restricted to a certain extent owing to the scarcity of supplies.

Practically all prices show an increase, and in our opinion we have not yet reached the top of the market.

General Chemicals

ACETIC ACID is much firmer and supplies seem to be falling off.

ACID, CARBOLIC.—There is no change to report, makers being very heavily sold and are not anxious to book further forward.

ACID, FORMIC.—There is no change to report, although the price is firmer.

ACID, OXALIC.—There has been a heavy demand for this material during the past week, and the price has an upward tendency; the small stocks which were held seem to have been taken off the market.

AMMONIUM SALTS.—A heavy demand still continues, and it is simply impossible to meet the demand.

SULPHATE is higher.

ARSENIC.—There has been a better demand for this material and the price shows a considerable advance.

BARIUM SALTS.—Chloride has again been in very active demand and the price is very firm.

COPPER SULPHATE.—A much better inquiry has been received for this product and the price is firmer.

FORMALDEHYDE.—The situation goes from bad to worse, and little or nothing is available for early delivery. The price is again higher, and consumers are paying very heavy prices for the small re-sale lots that are offering.

LEAD ACETATE.—Some very heavy orders have been booked for this product during the last week for delivery over the next three months, and the price has been advanced in sympathy with the metal, and a further advance is probable unless the raw materials are steadier.

LITHOPONE.—There is no change to report in this article, but the market has an upward tendency.

POTASSIUM PRUSSIATE is still in short supply and higher prices are being paid for forward delivery from the Continent.

POTASSIUM PERMANGANATE is higher and it is very difficult to meet the demand.

SODIUM ACETATE.—This material is rather dull at the moment and prices are inclined to be easy.

SODIUM NITRITE.—The demand for this material still continues, and only small supplies are coming into the country. A further advance is expected, and many consumers are endeavouring to cover their requirements for forward delivery, but makers are loth to quote.

SODIUM PRUSSIATE.—The scarcity still continues, and the makers are apparently unable to offer any further quantities for delivery over the first half of the year. Only a small quantity of foreign material is being offered, and the tendency is for higher prices.

ZINC SALTS are without change, although SULPHATE is in fair demand.

Coal Tar Intermediates

The market is very firm and there is a heavy demand for Beta Naphthol. Manufacturers are well booked ahead, and there are no spot parcels available.

ACETANILIDE.—A heavy demand is being experienced and supplies are very short.

ANILINE OIL is very firm, and supplies are unobtainable at the present time.

ANILINE SALT.—There is not a very great demand owing to the suspension of export licences.

BETA NAPHTHOL is in very heavy demand and manufacturers are now fully sold for some time ahead.

NAPHTHIONIC ACID.—The market is firm and it is difficult to obtain supplies.

PARANITRANILINE is practically unobtainable, although a little American is being offered at high prices.

PARAPHENYLENEDIAMINE is in better request.

SALICYLIC ACID.—The price is considerably firmer with a steady inquiry.

Coal Tar Products

There has been rather more business passing during the last week, and several manufacturers have shown a tendency to sell over the next few months.

90 PER CENT. BENZOL.—Business has been done at 2s. 1¼d. f.o.r. makers' works.

CRESYLIC ACID.—The demand for this article is maintained and the price is about 3s. 3d. for 97/99 per cent. and 2s. 9d. for 95/97 per cent.

CREOSOTE OIL is very fully booked, and the price is about 7¼d. at makers' works.

NAPHTHALENE shows a stronger tendency, refined being about £18 10s. to £20 10s., and crude £8 to £9 per ton.

SOLVENT NAPHTHA is still in the region of 2s. 10d. per gallon.

HEAVY NAPHTHA.—The price to-day is about 2s. 7½d.

PITCH.—The market remains firm and prices are still advancing. It is reported that 105s. f.o.b. London has been paid, and a similar figure f.o.b. east coast ports has been named.

Sulphate of Ammonia

There is no change in the position of the market. The demand for home trade remains good, and practically no business reported for export.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	9	to	0	3	0
Acetone oil	ton	77	0	0	to	80	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	85	0	0	to	90	0	0
Acetic, 80% pure	ton	67	10	0	to	70	0	0
Arsenic	ton	70	0	0	to	75	0	0
Boric, cryst.	ton	72	10	0	to	73	10	0
Carbolic, cryst. 39-40%	lb.	0	0	11½	to	0	1	0
Citric	lb.	0	4	3	to	0	4	4
Formic, 80%	ton	110	0	0	to	115	0	0
Gallic, pure	lb.	0	6	6	to	0	6	9
Hydrofluoric	lb.	0	0	7	to	0	0	8
Lactic, 50 vol.	ton	70	0	0	to	72	0	0
Lactic, 60 vol.	ton	85	0	0	to	87	10	0
Nitric, 80 Tw.	ton	37	0	0	to	39	0	0
Oxalic	lb.	0	1	5½	to	0	1	6½
Phosphoric, 1.5	ton	43	0	0	to	45	0	0
Acid, Pyrogallic, cryst.	lb.	0	11	6	to	0	11	9
Salicylic, Technical	lb.	0	2	6	to	0	2	9
Salicylic, B.P.	lb.	0	3	0	to	0	3	6
Sulphuric, 92-93%	ton	7	10	0	to	8	0	0
Tannic, commercial	lb.	0	4	6	to	0	4	9
Tartaric	lb.	0	3	5½	to	0	3	6½
Alum, lump	ton	19	0	0	to	19	10	0
Alum, chrome	ton	93	0	0	to	95	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	15	0	0	to	15	10	0
Aluminium, sulphate, 17-18%	ton	18	10	0	to	19	0	0
Ammonia, anhydrous	lb.	0	1	9	to	0	2	0
Ammonia, .880	ton	32	10	0	to	37	10	0
Ammonia, .920	ton	20	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	7½	to		—	

	per	£	s.	d.		£	s.	d.
Ammonia, chloride	ton	70	0	0	to	75	0	0
Ammonia, muriate (galvanisers)	ton	47	0	0	to	50	0	0
Ammonia, nitrate	ton	45	0	0	to	50	0	0
Ammonia, phosphate	ton	115	0	0	to	120	0	0
Ammonia, sulphocyanide	lb.	0	1	10	to	0	2	0
Amyl, acetate	ton	310	0	0	to	315	0	0
Arsenic, white, powdered	ton	70	0	0	to	72	0	0
Barium, carbonate	ton	13	0	0	to	14	0	0
Barium, carbonate, 2- 4%	ton	13	10	0	to	14	10	0
Chlorate	lb.	0	1	3	to	0	1	4
Chloride	ton	23	10	0	to	24	0	0
Nitrate	ton	50	0	0	to	51	0	0
Sulphate, blanc fixe, dry	ton	25	10	0	to	26	0	0
Sulphate, blanc fixe, pulp	ton	15	10	0	to	16	0	0
Bleaching powder, 35-37%	ton	17	10	0	to	18	0	0
Borax crystals	ton	39	0	0	to	40	0	0
Calcium acetate, grey	ton	23	0	0	to	25	0	0
Carbide	ton	28	0	0	to	30	0	0
Chloride	ton	9	0	0	to	9	10	0
Carbon bisulphide	ton	58	0	0	to	59	0	0
Casein, technical	ton	80	0	0	to	83	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	0	to	0	1	2
Cobalt acetate	lb.	0	7	0	to	0	7	6
Oxide, black	lb.	0	7	9	to	0	8	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	44	0	0	to	45	0	0
Cream Tartar, 98-100%	ton	245	0	0	to	250	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	195	0	0	to	200	0	0
Formusol (Rongalite)	lb.	0	4	0	to	0	4	3
Glauber salts	ton	3	10	0	to	3	15	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	40	0	0	to	42	0	0
Iron sulphate (Copperas)	ton	4	10	0	to	4	15	0
Lead acetate, white	ton	85	0	0	to	87	0	0
Carbonate (White Lead)	ton	61	15	0	to	64	15	0
Nitrate	ton	62	0	0	to	63	0	0
Litharge	ton	50	0	0	to	52	0	0
Lithophone, 30%	ton	48	10	0	to	50	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	13	0	0	to	13	10	0
Sulphate (Druggists')	ton	17	10	0	to	18	0	0
Methyl acetone	ton	89	0	0	to	90	0	0
Alcohol, 1% acetone	gall.	0	11	6	to	0	12	0
Nickel ammonium sulphate, single salt	ton	47	10	0	to	52	10	0
Potassium bichromate	lb.	0	1	6	to	0	1	7
Carbonate, 90%	ton	102	0	0	to	105	0	0
Chloride	ton	Nominal.						
Potassium Chlorate	lb.	0	1	2	to	0	1	3
Meta-bisulphite, 50-52%	ton	250	0	0	to	260	0	0
Nitrate, refined	ton	65	0	0	to	67	10	0
Permanganate	lb.	0	4	3	to	0	4	6
Prussiate, red	lb.	0	6	0	to	0	6	3
Prussiate, yellow	lb.	0	2	0	to	0	2	1
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	4	15	0	to		—	
Seconds	cwt.	4	10	0	to		—	
Sodium acetate	ton	50	0	0	to	53	0	0
Arsenate, 45%	ton	50	0	0	to	52	0	0
Bicarbonate	ton	10	10	0	to	11	10	0
Bichromate	lb.	0	0	11½	to	0	1	0
Bisulphite, 60-62%	ton	35	0	0	to	36	0	0
Chlorate	lb.	0	0	6	to	0	0	6¼
Caustic, 70%	ton	27	10	0	to	28	10	0
Caustic, 76%	ton	28	0	0	to	28	10	0
Hydrosulphite, powder, 85%	lb.	0	3	3	to	0	3	6
Hyposulphite, commercial	ton	21	0	0	to	22	0	0
Nitrite, 96-98%	ton	67	10	0	to	70	0	0
Phosphate, crystal	ton	35	0	0	to	37	0	0
Sodium, Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	1	2	to	0	1	2½
Sulphide, crystals	ton	16	0	0	to	16	10	0
Sulphide, solid, 60-62%	ton	28	0	0	to	30	0	0
Sulphite, cryst.	ton	11	10	0	to	12	0	0
Strontium, carbonate	ton	85	0	0	to	90	0	0
Nitrate	ton	85	0	0	to	90	0	0
Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	40	0	0	to	42	10	0
Flowers	ton	24	0	0	to	26	0	0
Roll	ton	23	0	0	to	25	0	0
Tartar emetic	lb.	0	3	4	to	0	3	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	2	10	to	0	3	0
Protochloride (tin crystals)	lb.	0	1	10	to	0	1	11
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	52	10	0
Oxide, 99%	ton	77	10	0	to	80	0	0
Oxide, 94-95%	ton	60	0	0	to	62	10	0
Dust, 90%	ton	70	0	0	to	72	10	0
Sulphate	ton	21	10	0	to	23	0	0
Oxide, Redseal	ton	75	0	0	to	80	0	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	0	to	0	3	6
Alphanaphthol, refined	lb.	0	3	6	to	0	3	9
Alphanaphthylamine	lb.	0	3	0	to	0	3	3
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.	0	1	5	to	0	1	6
Benzaldehyde (free of chlorine)	lb.	0	6	6	to	0	7	0
Benzidine, base	lb.	0	8	6	to	0	9	0
Benzidine, sulphate	lb.	0	7	0	to	0	7	6
Benzoic, acid	lb.	0	5	0	to	0	5	3
Benzoate of soda	lb.	0	5	0	to	0	5	3
Benzyl chloride, technical	lb.	0	2	3	to	0	2	6
Betanaphthol benzoate	lb.	1	6	0	to	1	7	6
Betanaphthol	lb.	0	3	6	to	0	3	9
Betanaphthylamine, technical	lb.	0	7	0	to	0	7	6
Croceine Acid, 100% basis	lb.	0	4	9	to	0	5	0
Dichlorbenzol	lb.	0	0	5	to	0	0	6
Diethylaniline	lb.	0	7	0	to	0	7	6
Dinitrobenzol	lb.	0	1	3	to	0	1	4
Dinitrochlorbenzol	lb.	0	1	3	to	0	1	4
Dinitronaphthaline	lb.	0	1	4	to	0	1	6
Dinitrotoluol	lb.	0	1	7	to	0	1	8
Dinitrophenol	lb.	0	1	3	to	0	1	6
Dimethylaniline	lb.	0	3	3	to	0	3	6
Diphenylamine	lb.	0	3	6	to	0	3	9
H-Acid	lb.	0	12	6	to	0	13	6
Metaphenylenediamine	lb.	0	4	9	to	0	5	0
Monochlorbenzol	lb.	0	0	9	to	0	0	10
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	0	to	0	8	0
Naphthionic acid, crude	lb.	0	3	9	to	0	4	0
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	6	to	0	5	0
Nitronaphthaline	lb.	0	1	3	to	0	1	4
Nitrotoluol	lb.	0	1	3	to	0	1	6
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	3
Orthotoluidine	lb.	0	2	2	to	0	2	3
Orthonitrotoluol	lb.	0	1	6	to	0	1	9
Para-amidophenol, base	lb.	0	14	0	to	0	15	0
Para-amidophenol, hydrochlor	lb	0	15	6	to	0	16	0
Paradichlorbenzol	lb.	0	0	4	to	0	0	5
Paranitraniline	lb.	0	5	6	to	0	6	0
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	3	to	0	5	6
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	13	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	9	6	to	0	10	6
R. Salt, 100% basis	lb.	0	5	0	to	0	5	6
Resorcin, technical	lb.	0	11	0	to	0	12	0
Resorcin, pure	lb.	0	17	6	to	1	0	0
Salol	lb.	0	4	9	to	0	5	6
Shaeffer acid, 100% basis	lb.	0	4	0	to	0	4	6
Sulphanilic acid, crude	lb.	0	1	6	to	0	1	8
Tolidine, base	lb.	0	12	0	to	0	12	6
Tolidine, mixture	lb.	0	2	9	to	0	3	0

SHIPMENTS of Alsatian potash salts have been resumed, and during the week ending January 3 2,129 tons of sylvinite 14 per cent. and 210 tons of sylvinite 20 per cent. were shipped to the United Kingdom. Prices of Alsatian potash salts remain unchanged: Sylvinite 14 per cent. (French kainit), £7 per ton; sylvinite 20 per cent. (French potash salts), £8 7s. 6d.; muriate of potash 80 per cent., £19 7s. 6d.

A NEW POLICY has been inaugurated in Ceylon regarding the lease of Crown lands for the production of plumbago. In future, instead of putting up the leases at public auction, the Government will charge a royalty per ton on all plumbago mined. Leases will also run for 15 instead of for five years. Those interested in the plumbago industry held a conference in Colombo last November to consider the best means to be adopted to protect the local output against foreign competition, notably from Madagascar. After hearing the views of delegates from different parts of the island, it was decided to recommend the Government to suspend the Custom duty on plumbago for some reasonable period. Meanwhile, arrangements will be made by a committee to organise the industry on a more business-like and practical footing.

Company News

DOMINION STEEL.—Dividend No. 32 has been declared at 1½ per cent. on the preference shares, payable February 1.

IPOH TIN DREDGING.—Dividend of 10 per cent., less tax, for the year to December 31 last, payable February 12 to holders registered January 31.

PAN DE AZUCAR NITRATE.—Dividend of 10 per cent., free of tax, for the year to June 30 last, against 30 per cent. for the previous year, payable February 4.

W. J. BUSH & CO.—Interim dividend of 10 per cent. per annum (1s. per share), less tax, for half-year, payable January 29. Last year dividend same.

CHAMPION (NIGERIA) TIN FIELDS.—Net profit for the year to June 30, £3,098. £3,623 is brought forward, making a total of £6,721, which it is proposed to carry forward.

PEARSON & KNOWLES. Negotiations are proceeding with a strong firm for the acquisition by the latter of the ordinary shares of the company at 30s. per share, ex. interim dividend.

UNION COLD STORAGE CO.—The dividend for the half-year ending January 31 is at the rate of 10 per cent. per annum on the A Preference shares.

NATIONAL MATCH FACTORY OF BOLIVIA CO.—The accounts for the year 1918 show a loss of £7,435, after providing for debenture interest. The adverse balance brought forward is increased to £23,209.

CANADIAN EXPLOSIVES.—A dividend of 1¾ per cent. on the 7 per cent. cumulative preferred shares has been declared for the quarter ended December 31 last, payable January 15 to holders registered December 31.

DISTILLER'S COMPANY.—The directors have declared an interim dividend for the current year on ordinary shares at the rate of 8s. per share (8 per cent. per annum), free of tax. Last year the dividend was the same.

CALICO PRINTERS' ASSOCIATION.—The directors announce that, owing to the difficulty of ascertaining liability for excess profits duty, it will not be possible to make an interim statement for the half-year ended December 31.

SHEEPBRIDGE COAL & IRON CO.—The directors have decided to pay an interim dividend of 6d. per share on the fully paid shares and 2·4d. per share on the partly paid shares, tax free. The distribution is the same as last year.

TAYLOR'S DRUG CO.—The profits for year ended June 30 last amounted to £32,981. The dividend on the preference shares for the year is 6 per cent. with a bonus of 1 per cent., and on the ordinary shares 10 per cent. and 5 per cent. respectively. A bonus of 1 per cent. on debentures has also been declared.

CASTNER-KELLNER & BRUNNER-MOND.—The directors of the Castner-Kellner Alkali Co. announce that they have received an offer from Brunner, Mond & Co. to purchase not less than 75 per cent. of the shares of the company not now owned by them by the issue of two fully-paid ordinary shares of Brunner, Mond & Co. for one fully-paid ordinary share of the Castner-Kellner Alkali Co. This offer they recommend to their shareholders for acceptance.

GUEST, KEEN & NETTLEFOLDS & JOHN LYSAGHT.—Arrangements have been made whereby the former concern acquires a controlling interest in the latter. An offer of purchase on similar terms will also be made to the remaining ordinary shareholders in the latter company. It is understood that the terms are as follows: For each ordinary share of Lysaght one ordinary and 1¼ 5 per cent. tax free second preference shares of Guest, Keen & Nettlefolds.

ANGLO-SOUTH AMERICAN OILFIELDS.—250,000 ordinary shares of 10s. each are offered for sale, being part of the companies capital of 500,000 10s. shares, of which 249,986 have been issued as fully paid up for the property acquired. Brazilian Commerce & Industries have purchased the shares now offered, and will receive applications for them at par through the London Joint City & Midland Bank. No debentures or preference shares will be issued. The company has acquired on a perpetual lease 750,000 acres of land in the Department of Santa Cruz, Bolivia.

BRITISH BURMAH PETROLEUM CO.—Balance of profit on the 12 months' working £131,400, as against £96,550 in the previous year. A final dividend of 1s. per share has been recommended, making a dividend payment for the complete year's working of 17½ per cent., free of income tax. Previous year's figure, 12½ per cent. When the whole of the proposed issue of new capital has been taken up, the working capital of the company will be increased by more than £500,000. The company has taken an interest in a syndicate which is now examining certain Eastern territories, and, judging from the reports already received, the work carried out gives promise of favourable results, such as, if confirmed, should prove beneficial to the future of the company.

GREAT WESTERN PETROLEUM CORPORATION.—A million 5-dollar shares are offered at par, in order to raise capital for the purpose of acquiring producing oil leases in the Burkburnett Texas Field now yielding four thousand barrels of crude oil per day. This capital is also to provide for additional pipe-line and loading rack facilities and tank cars to transport the crude oil obtained to the refinery, which is now operating profitably on Burkburnett crude purchased from other producers, to drill deep wells on the Kansas and Kentucky acreage, and for further working capital. In 1917 small dividends were paid, but during 1918, owing to war control, dividends were suspended, and in 1919 the earnings were devoted to improvements, repairs, and betterments.

BRITISH MOTOR SPIRIT SYNDICATE.—At an extraordinary general meeting held on the 12th inst., a resolution was unanimously adopted increasing the share capital by £750,000, in £1 shares. Mr. Alfred Armitage, J.P., chairman of the company, said that arrangements had been made for the company to operate a complete petroleum unit, so organised that they shared in the profits from the production, piping and refining of oil as well as the distribution in the wholesale way. Also the company was purchasing a 40 per cent. interest in a refinery organisation at Gilliam, in the Caddo Oilfield, and was now in a position to secure ample supplies of all petroleum products, including petrol, kerosene and lubricants. Storage had been arranged on the Thames, and the wharf purchased at Battersea had been passed by the London County Council for sufficient quantities of finished products to meet the original scheme of distribution in Great Britain.

BRITISH GLASS INDUSTRIES.—British Glass Industries, Ltd., has entered into a contract to purchase the controlling interest in a number of undertakings manufacturing electric lamp bulbs, tumblers, lamp-blown glass for scientific, medical and industrial purposes, crystal and table ware, and other types of glass not at present being made by British Glass Industries. These various companies will be amalgamated and controlled by a company to be called Webb's Crystal Glass Co., Ltd., the controlling interest in which will be acquired by British Glass Industries. The combination is at the present moment earning very large profits, which will be substantially augmented by the installation of improved automatic machinery. Among the companies concerned are: Thomas Webb & Son, Ltd. (established 1837), Edinburgh & Leith Flint Glass Co. (established 1863), Corbett & Co., Ltd. (established 1911), Medway Glass Works, Ltd., Robert Johnson Lamp-blown and Glassware Accessories Co., Ltd., R. Johnson & Co., Ltd. (established 1860), well-known glass factors and dealers, Samuel Pearson (West Bromwich), Ltd., E. M. Patents, Ltd., Philips, Ltd. In addition British Glass Industries' plant at Queenborough is to be enlarged and further works acquired for the manufacture of bottles and kindred ware in various parts of the United Kingdom. These arrangements will involve the issue of further capital, which will be offered almost immediately to the existing shareholders.

Company Bills in Parliament

Two Bills have been deposited for introduction into Parliament next session by Lever Bros. and Price's Patent Candle Co. to confer further powers upon these companies.

The former asks for powers to construct a wharf or landing stage on the bank of the River Mersey at Bromborough, and an island wharf or landing stage in the bed of the river, with a bridge connecting it with the left bank. From these wharves it is proposed to construct a railway just under half a mile in length, forming a junction with the existing railway sidings of the company. The existing facilities for the conveyance of the materials dealt with, both by land and water, are inadequate, and, in view of the extensions now in progress at the works, and the changing conditions in methods of transport, will become increasingly so.

The Bill deposited by Price's Patent Candle Co. seeks power to increase the capital to an unlimited amount. These powers may be exercised whether any part of the present authorised capital of £850,000 has been unissued or appropriated, but it is enacted that any increase of capital shall only be applied to the purposes of the undertaking. Provision is, however, made to enable the company, upon the recommendation of the directors, to pass a resolution to capitalise the profits of the company, including any reserve fund, by "applying the same in paying up in full unissued shares . . . and allotting and distributing such shares, credited as fully paid, amongst the holders of all the issued shares." Wide powers are sought for dealing with the proposed new capital, or the unissued shares of the present capital, in practically any manner the directors may think fit, including the sub-division and consolidation of shares and their issue with preferential or other special rights, to redeem the whole or any part of the £200,000 debenture stock of the Company, and to re-borrow the money "to an amount not exceeding the amount of the debenture stock so paid off."

A clause is also included to enable any director to appoint a person approved by the Board to perform generally all the functions of a director in his appointer's absence, and another to prohibit any shareholder, other than a director, from inspecting accounts, &c., except as authorised by the directors or by a general meeting.

Stocks and Shares

Commercial, Industrial, &c.

	Quotations Jan. 7.	Quotations Jan. 14.
Alby United Carbide Factories, Ord.	13/16–15/16	13/16–15/16
Associated Portland Cement Manufrs. (1900) Ltd., Ord.	26/3–27/3	25/9–26/9
Bell's United Asbestos Co., Ltd., Ord.	1⅞–2¼	1⅞–2¼
Bleachers' Association, Ltd., Ord.	2 7/16–2 9/16	2⅜–2½
Borax Consolidated, Ltd., Prefd. Ord.	3¾–4⅜	4–4½
Bradford Dyers' Assoc. Ltd., Ord.	3 3/16–3 5/16	3 5/16–3 7/16
British Aluminium Co., Ltd., Ord.	1 29/32–1 31/32	1 29/32–1 31/32
British Oil and Cake Mills, Ltd., Ord	1 15/16–2 1/16	2 1/16–2 3/16
British Portland Cement Manufrs., Ltd., Ord.	30/0–32/0	31/6–33/6
Brunner, Mond & Co., Ltd., Ord.	2 3/16–2 5/16	2–2⅛
Castner-Kellner Alkali Co., Ltd.	3 5/16–3 9/16	3¾–4
China Clay Corporation, Ltd., Ord.	¼–⅜	¼–⅜
Cook (Edward) & Co., Ltd., 4% 1st Mort. Deb. Stock Red	57–61 ×d	57/0–61/0 ×d
Courtaulds, Ltd.	7–8	7–8
Crosfield (Joseph) & Sons, Ltd., Cum. 6% Prefce	3 27/32–3 31/32 ×d	3 27/32–3 31/32 ×d
Curtis's & Harvey, Ltd. 4¼% 1st. Mort. Deb. Stk. Red.	69–71	69/0-71/0
Electro Bleach & By-Products Ltd., Ord.	15/0	16/7½–16/6
Explosives Trades, Ltd., Ord	22/0–2 3/0	24/0–25/0
Field (J. C. & J.), Ltd., Ord	1⅛–1⅛	1⅛–1⅛
Greenwich Inlaid Linoleum (Fredk. Walton's New Patents) Co., Ltd., Ord.	⅝–¾	23/32–27/32
Harrisons & Crosfield, Ltd., Prefd. Ord.	1¼–1⅜ ×d	1¼–1⅜ ×d
India Rubber, Gutta Percha & Tel. Wks. Co., Ltd., Ord	16–17 ×d	15½–16½ ×d
Lawes' Chemical Manure Co., Ltd., Ord.	4¾–5¾	4¾–5¾
Lever Bros., Ltd., 6% Cum. "A" Prefce.	18/3–19/0 ×d	17/10½–18/7½ ×d
Do. 6½% Cum. "B" Prefce.	19/6–20/3 ×d	19/6–20/3 ×d
Magadi Soda Co., Ltd., Ord	20/6–21/6	20/0–21/0
Manganese Bronze & Brass Co., Ltd., Ord.	⅝–¾	⅝–¾
Maypole Dairy Co., Ltd., Defd. Ord.	⅞–1	⅞–1
Mond Nickel Co., Ltd., 7% Cum. Pref.	1 1/16–1 3/16	1 1/16–1 3/16
Do. 7% Non. Cum. Pref.	⅞–1	⅞–1
Pacific Phosphate Co., Ltd., Ord.	4⅝–4¾ ×d	4⅝–4¾ ×d
Power-Gas Corporation, Ltd., Ord	11/16–13/16 ×d	11/16–13/16 ×d
Price's Patent Candle Co., Ltd.	91–96	—
Salt Union, Ltd., Ord.	1 19/32–1 23/32	1 19/32–1 23/32
United Alkali Co., Ltd., Ord.	1 9/16–1 13/16	1 9/16–1 13/16
Val de Travers Asphalte Paving Co., Ltd.	¾–1	¾–1
Van den Berghs, Ltd., Ord.	3⅝–3⅞	4¼–4½
Walkers, Parker & Co., Ltd.	1⅛–1¼	1 3/16–1 5/16
Welsbach Light Co., Ltd.	2–2¼	2–2¼
Gas, Iron, Coal and Steel		
Armstrong (Sir W. G.) Whitworth, Ltd., Ord.	35/0–36/0	35/0–36/0
Ebbw Vale Steel, Iron & Coal Co., Ltd., Ord.	1 5/16–1 7/16	1 5/16–1 7/16
Gas Light & Coke Co., Ordinary Stock (4% Stand.)	56–59	56/0–59/0
Hadfield's, Ltd., Ordinary	2–2⅛	2 1/16–2 3/16
South Metropolitan Gas Co., Ordinary (4% Stand.)	56–59	56/0–59/0
Staveley Coal & Iron Co., Ltd., Ord.	1¾–1⅞	1 13/16–1 15/16
Vickers, Ltd., Ordinary	35/9–36/9	35/0–36/0
Mines, Nitrate, &c.		
Anglo-Chilian Nitrate and Rly. Co., Ltd., Ord.	16–17	17–17½
Antofagasta Nitrate Co. Compañia de Salitres de Antofagasta) 5½% 1st Mt. Debs. Red.	85–90	85–90
Lagunas Nitrate Co., Ltd.	1⅜–1⅝	1⅜–1⅝
Rio Tinto Co., Ltd., Ord. (Bearer)	49–51	47–49
Tarapaca & Tocopilla Nitrate Co., Ltd.	17/0–18/0	18/0–19/0
Oil and Rubber		
Anglo-Java Rubber & Produce Co., Ltd.	7/9–8/3	7/9–8/3
Anglo-Maikop Corporation, Ltd., Ord.	5/16–7/16	¼–⅜
Anglo-Malay Rubber Co., Ltd.	14/7½–15/1½	14/7½–15/1½
Anglo-Persian Oil Co., Ltd., Cum. 6% Part.	1 7/32–1 11/32	1 7/32–1 11/32
Burmah Oil Co., Ltd., Ord.	19½–19⅝	20⅜–20⅞
Chersonese (F.M.S.) Estates, Ltd.	4/3–4/6	4/3–4/6
Linggi Plantations, Ltd., Ord.	3 7/16–3 9/16	3 15/32–3 17/32
Mexican Eagle Oil Co., Ltd. (Cia. Mexicana de Pet. "El Aguila" S.A.) Ordinary (Bearer)	10¾–11	12–12¼
"Shell" Transport & Trading Co., Ltd., Ord.	11½–11¾	13–13¼
Do. 5% Cum. Pref.	8½–9	8½–9

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnerships Dissolved

LIVESEY, ALEXANDER, GILL, BENJAMIN, and CHORLTON, JOHN HENRY, drysalters, &c., Lucy Street Works, City Road, Manchester, under the style of Livesey, Gill & Chorlton, so far as concerns the said Alexander Livesey, by reason of his death, as and from November 9, 1919. All debts received and paid respectively by Benjamin Gill and John Henry Chorlton, who will continue the business under the same style.

NIXON, JOHN HENRY, and HORNSEY, HARRY HARLAND, oxy-acetylene welders, 11, Grimesthorpe Road, Sheffield, under the style of the Central Welding Co., by mutual consent, as and from December 31, 1919. All debts received and paid by John Henry Nixon, who will continue the business.

SINGER, BERNARD LOUIS, and SINGER, WILLIAM MAXIMILIAN, essential oil merchants, 7, Clifton Street, Finsbury, London, under the style of L. Singer, by mutual consent, as and from January 4, 1920. All debts received and paid by William Maximilian Singer.

Company Winding Up Voluntarily

THE GRAPHITE PLUMBAGO CRUCIBLE CO., LTD.—A meeting of creditors will be held at the office of the Company, Tanner's Hill, Deptford, London, S.E.8, on Tuesday, January 27, at 11 a.m. E. Phillips, Liquidator.

Liquidators' Notices

OKLAHOMA OIL CO., LTD. (in liquidation).—A General Meeting of members will be held at Threadneedle House, 34, Bisopsgate, London, E.C., on Tuesday, February 10, at 12 noon. H. S. Hope, Liquidator.

SHAWBRUNER, LTD.—A General Meeting of members will be held at 6, Austin Friars, London, E.C.2, on Thursday, February 12, at 11.30 a.m. H. Wates, Liquidator.

THE SURREY FULLERS EARTH CO., LTD.—A General Meeting of members will be held at Apsley Place, Huddersfield, Yorks, on Tuesday, February 10, at 11.30 a.m. Harry Kaye, Liquidator.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of* 1908, *provides that every Mortgage or Charge, as described therein, created after July* 1, 1908, *shall be registered within* 21 *days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July* 1, 1908, *require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an* *—*followed by the date of the Summary, but such total may have been reduced since such date.*]

EASTERN COUNTIES BONE PRODUCTS CO., LTD., DUXFORD (CAMBS.).—Registered December 30, mortgage securing all moneys due or to become due not exceeding £4,000, to Lloyds Bank, Ltd.; charged on hereditaments and premises at Duxford.

LONDON PHARMACEUTICAL REFINERS, LTD., BROCKLEY, S.E.—Registered December 24, £1,000 debentures including the series of £500 already issued (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £500, being balance of the series; general charge. *£500. January 4, 1919.

RAGUSA ASPHALTE CO., LTD., LONDON, E.—Registered December 29, £10,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £4,000; general charge. *£3,000. January 14, 1919.

Satisfactions

ABERTILLERY PITCH & BENZOL CO., LTD., LONDON, E.C.—Satisfaction registered January 3, for £3,071, balance of £4,054, registered January 14, 1915.

CENTURY DYEWORKS, LTD., ELLAND.—Satisfaction registered January 5, two charges securing all moneys due, &c., not ex. £4,000, registered May 17, 1912.

New Companies Registered

The following list has been prepared for us by Jordan & Sons Ltd., Company Registration Agents, 116 and 117, Chancery Lane London W.C.:—

BEESWAX CO., LTD., 10 and 11, Lime Street, E.C.3.—Wax refiners and dealers in lubricating oils. Nominal Capital, £200 in 200 shares of £1 each. Directors: H. F. Tarnan, Brambley View, Bambledon Road, Wallington; T. F. Kellick, Heathside, Ewhurst, Surrey; M. S. Salamon, Rose Villa, Sudbury, Middlesex. Qualification of Directors, one share.

BODMIN CHINA CLAY CO., LTD., Finsbury House, Blomfield Street, E.C.—China clay, china stone, brick, tile, cement and glass miners. Nominal Capital, £175,000 in 175,000 shares of £1 each. Minimum subscription, £7. Directors: J. Macdonald, 28, Kensington Square, W.8; J. W. H. Bolitho, Penmont, Falmouth; J. H. Coon, St. Austel, Cornwall; C. S. Varcoe, Rosehill Par, Cornwall; E. Wace, 28, Belsize Square, Hampstead, N.W. Qualification of Directors, 100 shares. Remuneration of Directors, £150 each. Chairman, £200.

BUCKTON (GEORGE) & SONS, LTD.—Drysalters, oil merchants, &c. Nominal Capital, £15,000 in 15,000 shares of £1 each. Directors: W. H. H. Hutchison, Elloughton Rise, Brough, East Yorks.; W. H. H. Hutchison (Jun.), Elloughton Rise, Brough, East Yorks.; J. A. Carlill, 13, Victoria Road, Bridlington, Yorks.; J. Buck, 39, Blenheim Street, Hull. Qualification of Directors, £200. Remuneration of Directors, £50 each.

RESOLVEN TIN PLATE CO. (1919), LTD., Resolven Tinplate Works, Clyne, nr. Neath, Glamorgan.—Tin plate manufacturers. Nominal Capital, £60,000 in 60,000 shares of £1 each. Directors: J. M. Bevan, Ffrud Vale, Neath, Glam.; W. Hopps, Baglan Lodge East, Briton Ferry, Glam.; H. W. Crawford, The Ridge, Langland Bay, Glam. Qualification of Directors, £500.

RICHMOND GLASS WORKS, LTD., The Retreat, Retreat Road, Richmond, Surrey.—Glass manufacturers. Nominal Capital, £75,000 in 500,000 Participating Preference shares, and 250,000 Ordinary shares of 2s. each. Minimum subscription, 7 shares. Directors: T. A. Ruf, 1, Abinger Road, Bedford Park, W.4; O. Moreels, The Retreat, Richmond; J. Callie, 29, Rosebery Road, Clapham Park, S.W.2. Qualification of Directors, 10,000 shares.

Situations Vacant

(Three lines, 3s.; each additional line, 1s.)

Unless specially asked for, Original Testimonials should NOT be forwarded with Applications, but only copies of them.

ORGANIC CHEMISTS.

Applications are invited from well-trained Organic Chemists for positions in the Research Laboratories of the British Dyestuffs Corporation Limited. A thorough theoretical and practical training in organic chemistry is essential; experience of Research work is an additional recommendation. Apply, giving full particulars of career, degrees, etc., together with copies of any testimonials, to—

THE CHEMICAL SECRETARY,
BRITISH DYESTUFFS CORPORATION LIMITED,
Blackley, Manchester.

Situations Wanted.

(Twenty-seven words, 2s.; every additional 9 words 6d.)

SPANISH GENTLEMAN, at present residing in this country, with thorough knowledge of English and other languages and with good commercial training, would accept post as resident or travelling agent, in any line, for Spain or South America. Personal interview invited. Satisfactory references.—Box No. 45, CHEMICAL AGE Offices, 8, Bouverie Street, E.C. 4.

Notices

(Three lines, 3s; each additional line, 1s.)

CHEMICAL PATENTS, INVENTIONS, or TRADE MARKS Advice and handbook free. Write KING'S PATENT AGENCY, Ltd. 165, Queen Victoria St., E.C. 4; or 'Phone Central 268.

For Sale or Wanted

(Three lines, 3s.; each additional line, 1s.)

SPECTROSCOPES, MICROSCOPES, bought, sold, and exchanged. List free.—JOHN BROWNING, 146, Strand, W.C.

WANTED.—LEAD, remelted in pigs or ingots. Also Lead Ashes, Slags, and Skimmings. Prompt cash terms.—SPOONER, SON & CO., 214, Bishopsgate, London, E.C.2. Telephone: London Wall 5959. Telegrams: "Spooneral, London."

3 OIL TANKS, 8′ 6″ dia × 30′ 0″ long, capacity about 10,400 gallons, tight for storage. Only £150 each.
6 DISHED AIR RECEIVERS or PRESSURE TANKS, 6′ 0″ dia. × 24′ 0″ long, tested to 60/80 lbs. pressure.
3 BOAT SHAPED TANKS, from Lancashire Boilers, 8′ 6″ dia. × 30′ 0″.
Large stock various Tanks, Receivers, Chimneys, etc. Priced List, drawings sent on application.—FIRTH BLAKELEY, SONS & CO., LTD., Church Fenton, via Leeds.

SMALL QUANTITIES required of carefully graded SAND from medium down to very fine.—Apply Box 47, CHEMICAL AGE Offices, 8, Bouverie Street, E.C. 4.